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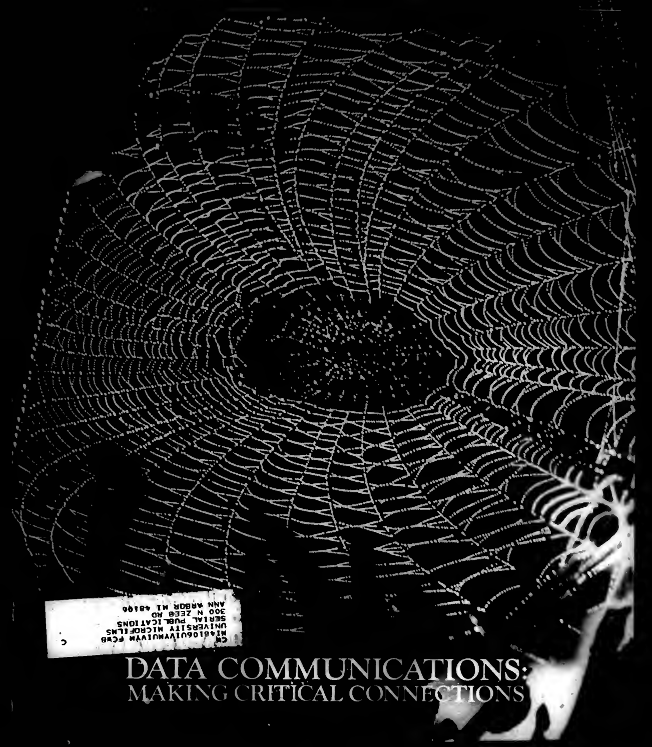

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The spider's web is a curious creation. Each is a unique expression of its creator, and some spiders weave more orderly and beautiful webs than others. The fine strands reflect both art and function, just as our communications technology allows not just faster but also more enhanced communication. If we can communicate more efficiently, perhaps we will be able to communicate more meaningfully as well. The quality of our communication will greatly affect the future, not just in business, but throughout our entire social order. The connections we are making not only encircle the earth, but reach far into space as well.

This issue of *Computerworld/Extra!* takes communications out of the sky-blue and puts it on terra firma. Our intent is to offer interesting yet pragmatic ideas you can begin thinking about and working with now. These articles, covering a variety of subjects, were written by industry leaders to give you important new insights. Some cover managerial topics such as business strategy, new regulatory concerns and interpersonal communication. Four communications experts offer their views on how DP managers should plan a communications strategy for the next year or two. We take a hard look at AT&T's plans for the '80s. Other articles focus on technical issues, such as digital termination systems and open system architecture. The history of telecommunications is shown in a four-color poster on Page 94.

We hope you find this issue useful and interesting. Ultimately, our most critical connection is with you. Any thoughts or comments you would like to share are most welcome.

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Command, Control, And Communications

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•Business Applications•

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By Peter G.W. Keen

ON BECOMING AN INFORMATION COMPANY:
A GUIDE FOR DP MANAGERS

We can talk all we want about productivity, teleconferencing, interpretation and so on, but cultural forces and social interests strongly influence the pace at which a new technology is assimilated by individuals and organizations. It is clear that communications technology will change the way business is done, create new markets and alter the nature of work and organizational life. The DP management structure was not designed for a world of communications technology. It reflects a manufacturing focus, a deliberate isolation of computing from the mainstream business and a reactive role for top management. In many instances, DP sets the applications priorities. It is clear that this is changing. In organizations making the most effective use of the new technologies: The DP — or information systems — function reports at a very senior level; steering committees provide the organizational mechanism and authority to set priorities; the job of the systems analyst increasingly emphasizes communica-

New roles for people must precede new communications opportunities.

tion, consulting skills and service; and more and more resources are committed to end-user tools.

Any comprehensive communications-based strategy relies on accelerating the shift from DP as a manufacturing department — in which jobs are based on building systems or on operations — to an "information company."

The head of informations systems has to have the authority, visibility and breadth of focus to coordinate an organizational resource relevant to all business functions and units. User-liaison roles are filled by such key personnel as:

- Business-oriented analysts.
- Office technology specialists.
- Functional support staff for end users (and support for a financial modeling capability).
- Technical support staff (for instance, for a hot line to a DBMS specialist).
- Planners (for network standards and capacity, analysis of user needs and technical options and so on.)
- Educators and trainers.

There is ample reason to expect the current shortage of skilled analysts, technical specialists and, above all, technology managers to grow even worse in the next few years. Backlogs of development projects, already large, will grow as supply creates demand.

Paper Exercise

It would be an illuminating exercise actually to create the information company on paper by pooling all computer-related costs and assets, including modems, communications lines and terminals. The company's investment in software — if known — should be capitalized and depreciated as the long-term asset it is. (Botched development efforts should be written off.)

The resulting balance sheet may well be among the largest business segments in the organization. Its management structure should reflect this. One may ask how many senior managers it has; how much it spends on research and development, marketing and human resource planning; what the career path is to senior management; and so on. It should have adequate strategic planning mechanisms and sophisticated costing and pricing analyses.

In practice, the information company usually is run by a few overworked, outstanding "hybrids" — people who are fluent about technology and literate about business and applications, or vice versa. There is a virtual absence of middle management talent and no succession planning.. Analysts are confronted by new demands of a user-driven environment: communication, awareness of business priorities, service and consultancy skills.

Worse than all this, there is a vast shortage of telecommunications staff to handle technology assessment, network planning, long-term capacity analysis, purchasing, costing of components and services, installation and the traffic to the highways and vice versa.

It will be a waste of time for organizations to get ready to exploit the opportunities communications technology opens up, if those organizations fail to create the roles and to develop the people critical for this new context.

Educating the Organization

Creating these roles and broadening the management focus is obviously not something information systems can do unilaterally. Communications technology implies a change in authority for planning and setting development priorities, reorganization and major changes in staffing, hiring and promotion. Top management, both at the corporate level and in the user department, needs to be brought into the process.

This means strategic education. In too many companies, DP is gearing up to meet the challenges of the new computing environment but lacks the needed authority and mandates. Management has generally gotten along adequately with limited knowledge of computers. Relatively suddenly, they need to be proactive, not reactive, and to make strategic policy decisions, especially in the following areas:

- Regulating the free market: deciding which aspects of the ideal capability require central direction (and therefore stay within the DP monopoly) and which are local option and can be purchased in the free market.
- Setting the criteria for selective application and establishing priorities. Given even existing backlogs, there is simply no way increased demand for applications can be met.

Unfortunately, management is generally puzzled by computers. The education available to them focuses either on concepts or details and rarely relates them.

It is undesirable either to overwhelm managers with inert details (try explaining X.25 vs. SNA) or to ignore them and rely on simple, general concepts (for example, "A distributed processing system should correspond to the organization's style and structure; it makes no sense to run a fully decentralized system in an organization with a strong central planning and central focus).

Educating top managers is an essential step toward creating the information company and meshing the business and technology plan. This step needs to be supported by a sustained commitment to education at all levels of the organization. For example, implementation skills are imperative for systems personnel; they can no longer just handle technical issues and leave the rest to the user. They have to learn how to design for implementation. Office technology, for instance, involves little systems development, but major organizational changes.

At the same time, users can no longer delegate to technicians decisions that affect every aspect of their businesses. They have to get "involved," but they lack the vocabulary and methods to do so. How do they help develop functional specifications or a testing plan? They need to learn what happens in systems development and what their roles are.

Telecommunications and data management together constitute a new computing environment. There is as urgent a need to get DP people oriented toward that environment as to bring users up to date. In many companies, attention and money is increasingly given to user education, but the busy DP staff gets little of either. They are provided with seminars to update the technical skills they need for current jobs, but not to prepare them for a world of communication and end-user tools where consulting skills and knowledge of business functions are essential.

Strategic computer education is expensive — and vital. If we think of communications technology — and the terminal that is its concrete embodiment — as a culture shock, then education needs to lead rather than follow change.

On the whole, DP has not played an active role in strategic education. In fact, training efforts by DP have often made the culture gap even wider. Such training programs reinforce users' expectations that computers are boring, complicated, not very useful and, worse, that computer people do not care about helping users. There is a difference between education and training.

Stimulate Creative Thinking

The distinction between information highways and information traffic is an important one. With traditional batch-oriented technology, there was relatively little scope for innovative thinking about application. The infrastructure was the traffic. Communications (and, to a lesser extent, the microcomputer) relies on creativity. For example, real estate companies in Boston can now show customers houses in California; mortgage applications can be sent by fax to a bank specializing in home loans; an oil company allows distributors to access a data base on inventory levels in order to smoothe out orders; an insurance salesman carries a briefcase with a modem that allows the creation of custom-tailored plans in the customer's home.

These innovations provide a competitive edge. They are simple, clever ideas that result when an expert in traffic links up with an expert on highways. We simply have no idea of the limits even of existing communications technology on such innovations. Moreover, these innovations tend to be fairly inexpensive because the bulk of the investment has already been made — in the network.

Prestel, the British Post Office's videotext experiment, provides a useful lesson about creative thinking. Prestel was a major technical innovation that was watched carefully in the U.S. It has not become an application innovation. That it would not do so has seemed obvious for several years. Most of the data accessible via Prestel was simply either not worth paying a premium for or better obtained manually: restaurant guides, timetables, price lists or, to the UK government's dismay, guides to Soho pornography stores.

A terminal is just a terminal. A network is just something you take for granted unless it is malfunctioning. Perhaps a key rule for communications technology is: if, in a demonstration, your selling point is the terminal and you need to focus on the network, you are in trouble. The user

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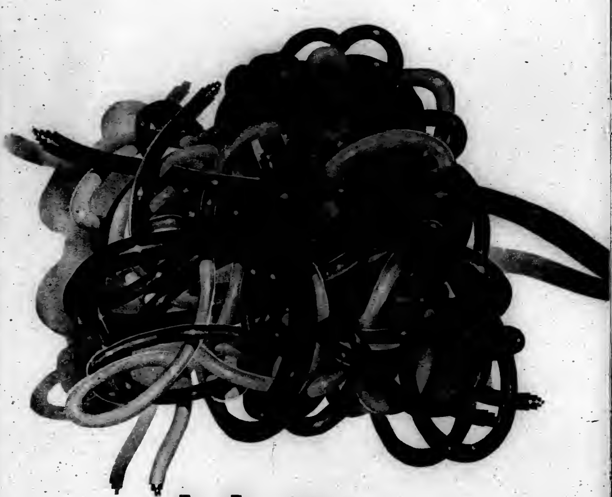

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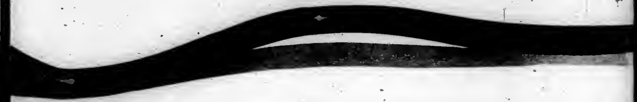

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' Quite simply, the quality of many user-system interfaces is horrible.'

is excited by functional capability, which for communications means data and/or a business edge. Prestei remains a brilliant infrastructure — with dull traffic.

The people in the organization most likely to come up with creative applications are the ones closest to the business environment: in such areas as marketing, customer service, and corporate planning. The isolation of many DP units from the wider organization means they cannot add to this list. Nor do they have contacts or credibility with marketing.

Improve Design Skills

In a world of communications, the user is a consumer. We all know a lot about consumers — they are ourselves. We buy calculators and cars on the basis of more than just functionality. Such factors as ease of use, aesthetic design, service and packaging differentiate the product.

Some DP units are so used to having a monopoly on computer use that they may not realize that we have moved from supply to demand economics. If a a customer or a manager in our organization dislikes our decision support system or teleconferencing capability, that person will not use it.

Quite simply, the quality of many user-system interfaces is horrible. DP professionals' skills have been mainly in the area of data structures and procedures. Lacking clear concepta of users and of the context of use, they too often impose inflexible, uncommunicative systems. This is simply unacceptable to discretionary consumers.

Any analysis of what makes end-user software sell — packages, languages, inquiry systems and so on — will highlight the importance of ease of use, ease of learning, robustness and flexibility. Providing these requires good technical skills, which are hard to learn, and a solid understanding of users and uses, which is easy to learn when the technician recognizes its importance. It mainly requires spending time with users, observing and listening.

The interface is the system.

Getting Started

It is hard to break away from a technocentric world view. The DP field has not commanded respect for its breadth of focus and its concern for relating its technology to organizational life and business activities. The payoff for telecommunications and business strategy is potentially huge. It involves a joint venture between colleagues — users and systems.

The starting point is the business plan: what are the critical success factors for the organization? What are the opportunities for new products and services? Where can improvements in information access and distribution and in communication improve effectiveness?

If the senior information systems planners do not know where to get answers to these questions, all they can do is build the communications infrastructure and hope. The questions define the criteria for a computing strategy. That strategy cannot in itself answer them.

Given the atrategy, management needs to know the strategic choices and tradeoffs. The details involve private vs. value-added networks, SNA, X.25, intelligent terminals, capacity and buying bandwidth. The concepts relate to the user — to traffic. Only when management and information systems jointly evaluate what the communications capability should provide, in terms of information creation, access and distribution, can a network architecture be defined. The architecture should not determine the capability and use.

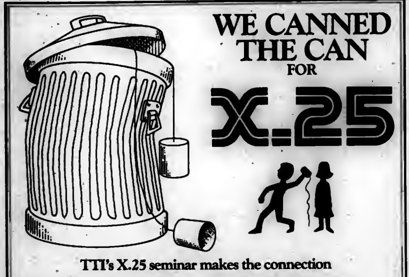
Given the architecture, the final and key issue is delivery. Who leads the planning and implementation process? With what authority? What roles must be filled for effective coordination? What education is needed? What are the design criteria?

The planning horizon for a communications strategy is 1985, not 1982. The technology is still in flux and demand characteristics unclear. We are atill a long way from true integration of the technological building blocks underlying the ideal capability. It may well be that the best short-term plan is to try and avoid decisions that commit the organization over the long term.

Information systems needs to get ready for 1985, and that means getting the organization ready. Perhaps the two key components of the 1982 strategy are strategic education and the creation of the new roles communications implies.

Communications technology represents an immense organizational opportunity. It requires an organizational focus.

Peter G.W. Keen is an associate professor of management science and member of the Center for Information Systems Research at MIT. ◆



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By Beverly Johantgen

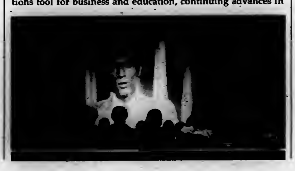
VIDEOCONFERENCING:

A BRAVE NEW WORLD

During the 1980s, most of us will experience a new dimension in business communications — the videoconference. This new communications tool will include all three currently primary means of business communication:

- Personal communication through face-to-face meetings.
- Verbal communication through use of the telephone.
- Visual communication through written format, such as letters and memos.

Electronic conferencing has been available for many years in the form of the simple telephone conference call. Videoconferencing adds the next dimension to these electronic conferences because it provides a form of face-to-face contact without the necessity of travel. At the same time that the electronic medium of television has come into prominent use as a communications tool for business and education, continuing advances in



One firm's videoconference dropped costs from $288 to $70 per attendee.

satellite technology have made the private use of television far more cost-effective. Videoconferencing is the next logical step in the growth of the electronic conferencing business.

Recently, large-screen television has made videoconferencing more acceptable, even in live convention settings. This device has enhanced the acceptance of a "live via satellite" videoconference as a means of communication. At a recent videoconference for the Seventh Day Adventists, the origination site featured a 24-foot television screen in addition to the live presenters. The majority of the 1,000 people in the audience seemed to prefer watching the live television screen instead of the live presenters.

The most important aspect of either a videoconference or a live conference is the careful preplanning of the program to meet the objectives of the conference. Currently available video techniques should be considered in the preparation of materials, because appropriate video effects can communicate a particular idea, statistic or new product with even more impact than can a live presentation. Television technology now used for entertainment can also be used for effective business communication.

However, the use of special effects should not overwhelm the subject matter being presented.

Over the past several years a number of studies have been done on the psychology of videoconferencing and the effectiveness of these presentations. These studies have found that when this medium is used with an understanding of its expense, presenters generally organize their materials in a time-efficient manner.

The use of the electronic medium has a strong tendency to keep the subject matter discussed within the specific objectives of the meeting. Not only is travel time saved in getting the participants together, but also "on-line" time is saved because of better organization.

Available Technology

Teleconferencing by telephone still encounters some resistance. Even today, after many years in which the telephone was used as a means of electronic conferencing, many sales and motivational organizations still believe face-to-face contact is an absolute requirement for complete communication.

Facsimile transfer, slow-scan and compressed video have added to the communications value of audio conferences. Pictures transferred under these conditions are somewhat poorer than the full video we have all experienced in live television. In a conference situation, slow-scan picture transmission is very often adequate and useful, depending on the live interaction required. The use of slow-scan or compressed video pictures, although poorer in quality than full motion television, is perfectly adequate and far less expensive than a full-motion color video transmission.

Full-motion one-way video is gaining rapid acceptance for conferences that are primarily one-way communications. Such conferences are suitable for educational meetings where basic information is being presented to conference attendees in remote locations and complete interaction is not necessary.

	1981 Teleseminar	1980 Road Show
Number of Cities	27	6
Total Attendance	1,300	650
Employee Expenses	$13,000	$54,000
Facilities Expenses	42,000	44,000
Production Expenses	37,000	69,000
TOTAL	$92,000	$167,000
Cost Per Attendee	$70	$288

Figure 1

Full-motion one-way video/two-way audio is currently the most widely accepted form of videoconferencing. It is presented to a group of conference attendees at a remote site or several remote sites with the ability for complete audio interaction.

This form of videoconferencing is most suitable for education, new product introductions, sales, training or any other meetings that present information to a widely dispersed group of people. Videoconferencing of this type is now growing most quickly; it becomes cost-effective as the number of attendees at the remote sites is increased.

Full-motion two-way video/two-way audio is the most complete form of videoconferencing. It provides for complete visual and audio interaction by the participants and is the closest thing to a face-to-face meeting. Although it is the most expensive form of videoconferencing, it can nevertheless still be cost-effective, depending upon the number of people who would otherwise be required to travel. Full-motion video interactive conferences such as this can be accomplished between two sites or multiple sites.

Available Networks

A number of companies, such as Videonet, can establish temporary closed-circuit networks for videoconferencing. Depending upon the objectives of the user, these networks can be developed for a complete two-way video/two-way audio conference or a one-way video/two-way audio conference. These private networks established for videoconferences are gaining rapid acceptance; they are "custom designed" to fit the individual needs of each user.

Holiday Inns have established permanent satellite receiving equipment in more than 200 of their hotel properties across the U.S. Their initial intent was to provide in-room entertainment for hotel guests; however, these same receivers also can be used for videoconferencing.

Major Closed Circuit Networks

Network	Cities
TRW Information Services	28
Devon Electric Co. (two-way video)	2
John O'Donnell & Associates	32
National Association of Manufacturers	25
Ford Motor Co.	2
Ford Motor Co.	38
It Is Written (Seventh Day Adventists)	20
Allied Van Lines	26
Datapoint Corp.	23
Michael Baybak & Co.	12
Firestone Tire & Rubber Co.	2
NCR Corp.	23
Merrill, Lynch, Pierce, Fenner & Smith	30

Figure 2

This particular network provides an excellent permanent receive-only network for videoconferencing. There are a number of economic and reliability advantages to the Holiday Inn network for some videoconferences.

Many Public Broadcasting System facilities throughout the country have permanently installed receive-only earth stations, and they are also available for videoconferencing uses. Most of these facilities have fine studio equipment and personnel for origination of videoconferences.

In addition, several independent hotels and universities have begun installing permanent satellite receive-only earth stations. Many of these facilities are also available for videoconferencing.

What Does it Cost?

Videoconferences have a number of components that will determine the actual cost, including preproduction, television production, length of broadcast, site of program origination, interactive audio system, number of receiving locations, projection equipment used for viewing and meeting room facilities and catering expenses.

As a result, it is very difficult to develop a "rate card" for a videoconference. However, a few examples might help point out the cost-effectiveness of such events. Kathryn Bradford, manager of meetings and conventions for Allied Van Lines, has provided a comparison of costs for a videoconference produced for Allied and the previous year's road show (see Figure 1).

Another example of a major point-to-multipoint location seminar is the closed-circuit network established in September 1980 for Merrill, Lynch, Pierce, Fenner & Smith. A closed circuit network of 30 receiving locations was established in hotel facilities around the country. The program on the new tax law and its effect on investors was two and one-half hours in length. The size of the audience in the receiving locations varied from 450 to 2,000 people. The approximate cost per attendee for the network portion of this program was less than $7.

With travel and entertainment expenses increasing at a rate of almost 35% annually, many organizations need to find a more economical, yet effective, means of communicating with their regional personnel, customers and potential customers. Videoconferencing answers that need.

Beverly Johantgen is program director for Videonet, a teleconferencing firm in Woodland Hills, Calif.

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Viewpoint

DEVELOPING A COMMUNICATIONS

HOWARD FRANK

Howard A. Frank is president of Contel Information Systems, Inc., an organization that is dedicated to the area of network science. Frank took his Ph.D. in electrical engineering from Northwestern University and taught at the University of California at Berkeley. He has consulted in both industry and government and was special consultant in charge of network analysis activity to the Executive Office of the President of the United States. Frank directed his firm's design studies for the Advanced Research Projects Agency network (Arpanet) and has led projects in electronic funds transfer, inventory control and corporate communications.

How would you describe the field of communications today?

There is a battle for supremacy going on between the DP manager and the telecommunications manager, the kind of thing where victory is not based on how smart you are, but on how well you play the political game. The battle is characterized by who is going to control communications in the organization — not only data communications, but voice communications as well. Voice communications has more leverage in terms of cost — 90% is voice, 10% is data. As the technology becomes integrated, management will become integrated as well, and I think the DP manager will win the battle.

What sort of skills will the DP manager need when this happens?

A command of the jargon is important in the first magnitude. I recently spoke at a conference of DP and communications managers and when I asked if anyone knew what an erlang was, only three out of a hundred people raised

(Continued on Page 16)

FREDERIC G. WITHINGTON

Frederic G. "Ted" Withington is vice-president of information systems at Arthur D. Little, Inc. (ADL), where he has spent the last 21 years working with clients in virtually every aspect of data processing. Withington has a B.A. in physics from Williams College and, among other professional activities, has been a visiting professor at the Harvard Business School. He has authored over 30 articles and four books, the latest being The Environment for Systems Programs *(Addison-Wesley, 1978). Since 1964, he has been responsible for an annual series of ADL studies of the data processing industry.*

What are the main concerns in data communications today?

Users are building distributed processing networks and are trying to figure out how to interface intelligent terminals, word processors and personal computers in these networks. They are not generally interested in open-ended office automation, which is basically unstructured productivity enhancement for managers and professionals.

Yet business productivity is, supposedly, one of our greatest concerns.

There's a lot of discussion, but we don't see a great deal of implementation. What we do see happening is business automation. There is a specific business objective, which is supported by a network that often integrates voice and data. For example, agent systems in the insurance industry use data processing to rate a policy and work out premiums, and text processing to pro-

(Continued on Page 17)

STRATEGY

LEONARD KLEINROCK

Leonard Kleinrock is professor of computer science at the University of California, Los Angeles, and president of Technology Transfer Institute. He received his Ph.D. in electrical engineering from MIT and is a Guggenheim Fellow, an IEEE Fellow and an IEEE Distinguished Lecturer. He has published more than 140 papers and is author of Communication Nets: Stochastic Message Flow and Delay *and the two-volume* Queueing Systems *(John Wiley & Sons). Kleinrock is internationally respected for his work in computer networks and lectures extensively on the subject.*

As DP managers do their strategic planning for the next year or two, what should their priorities be?

The interest in office automation has created an enormous need for in-building communications, commonly referred to as local-area networks. There are over 100 products on the market and great confusion exists in terms of which are cost-effective, which will remain useful over a period of time and which best meet industry's needs.

How do you define these needs?

The need is for wideband, inexpensive, reliable communications among local devices within a building or within a few miles of each other. The force behind that need, as I mentioned, is due to office automation and the appearance of microprocessors, smart terminals, improved communication media — such as coaxial cable and the newer fiber optics — and new advances in multi-

(Continued on Page 18)

ALLEN F. REHERT

Allen F. Rehert, director of the Data Network Systems Engineering Center at Bell Laboratories, Inc., took his Ph.D. in electrical engineering from the University of Pennsylvania. He has been at Bell Labs since 1962. He holds a patent for his work on the design of a traffic service position system and has worked on wired logic computer systems and main distributing frame automation. He is the author of a number of articles and a frequent lecturer. In 1977, he joined the center and began developing requirements for what was to become Advanced Communications Service (ACS). In 1981, he was appointed director of the center and of ACS.

What impact will telecommunications have on business goals in the next year or two?

There are many more technological options available now that will allow the firm or DP manager not just to respond to business needs, but to actually help create them. Companies should look to combining data processing and telecommunications technologies in planning what business the firm is really in and how these technologies will help determine the business' direction.

There are two options or dimensions: data processing and communications. In DP, the trend is away from the single, large mainframe in a central location to shared distributed processing and even to personally affordable, knowledge-worker desktop technologies. These processing options allow the firm to determine needs based on centralized or decentralized; dedicated or shared; or inside services vs. outside, time-sharing services. This all means you don't have to pick the processing technology first. You can see what peo-

(Continued on Page 19)

Viewpoint

'You have to be able to understand and operate within the political environment.'

(Continued from Page 14)

their hands. *(An erlang is a unit of voice traffic measurement . . . ed.)*

Yet the crucial missing link is not technical virtuosity, but management flexibility and understanding. The key is the relationship between what the organization is trying to do and how the telecommunications function fits into that context. Many managers don't understand how to go from general corporate goals and missions to the specifics of what the communications function should do. For example, they understand controlling costs, but not in looking at the system, its objectives and how they match the company's business goals.

How can the manager learn the company's goals or mission?

The annual report is an excellent place to begin. Few have had any exposure to the business plan, and fewer yet have spoken with the corporate development people. These are the most important things the DP manager can do. Corporate development people impose a strategy and a methodology on the corporation, and that same methodology is transferable to planning communications and information systems. By talking to these people, you win two battles simultaneously: one, senior management learns the true value of communications and information processing and, two, it helps you develop your own methodology.

This sounds great, but how does the manager develop a methodology?

Well, it has to begin with the manager asking how his division can best leverage its resources for the overall corporate mission. The manager can't simply say, "My mission is to keep this corporation at the leading edge of technology." He just doesn't have the authority; it needs corporate-level sanctification. And in obtaining that top-level support, the manager needs not technical skills, but human relations skills.

Because of the lack of human communication, there is very little understanding between these levels of management. You have to be able to understand and operate within the political environment and you can't learn about it from trade magazines. I'd be willing to bet that few DP or communications managers read *Business Week*, *Forbes*, or other business journals. They're a good place to begin learning about methodologies.

In addition, there are half a dozen conferences, such as Communications Networks, which are excellent educational opportunities. Anybody who doesn't go to two or three of these a year is missing the boat.

Third, there are three-day or week-long courses. Their value is somewhat limited because it's hard to learn a great deal in such a condensed format.

And in this way the DP manager can learn more about both human and network communications?

Precisely, and let me give you an example. An insurance company asked us to design a system where operators entered data at branch offices and sent it to the central computer, where the information was validated, then printed out. There were two problems: the network design itself and a computer that was saturated but couldn't be replaced, due to time constraints.

The network people were trying to optimize the network, which cost $25,000 per month; the operations people were trying to optimize their area, which cost $35,000 a month; and the computer people were trying to optimize the computer, which cost $85,000 per month. This, of course, was something they needed to do, but no one had thought about optimizing the 300-odd operators at the remote terminals, which cost $550,000 a month! I calculated that with an incremental cost of $10,000 a month on the network, you could cut the operator cost by 10%, thus saving

(Continued on Page 90)

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(Continued from Page 15)

vide the necessary clauses. The purpose is to cut costs and improve responsiveness and to automate a great part of the agent's office with a specific, business-pointed type of system. But you see, the point is not to provide some sort of generalized graphics, text, voice or data-type of terminal the agent may not know what to do with.

But that sounds like the executive workstation, which is supposed to be in great demand.

Today's executive workstation is the telephone, because what executives do most is talk. They do read things, which come from a file or in the mail, and they probably do some writing and look at data. But they rarely create data, and most files could not be indexed and organized in soch a way that they could be directly rekeyed into a computer, even if you could afford to do so. The executive terminal will certainly evolve, probably from a conventional personal computer or terminal with a telephone alongside. It will soon handle limited graphics information, and later the voice telephone will be integrated into it. But the communications facilities and files must develop first. Eventually, all four media — data, text, graphics and voice — will be handled by the executive terminal.

And this might be a personal computer?

Definitely. Most in use today are for local processing and only incidentally for communications. But it doesn't take much knowledge of applications to realize that most of the work people will use them for involves remotely provided information: company data, annual reports, stock prices, the downline loading of software. The communications links and software these users want will have to be consistent with the organization's standards and networks.

So how does the DP manager deal with the onslaught of these machines?

I've spoken to many DP managers and concern is widespread. Most feel they must turn the trend to their advantage. One suggestion was to sell two or three brands of personal computers supported by the DP shop in a company store. This allows buying in volume discounts, ensures expert instruction and assistance and verifies standards and vendor support for the central DP function. It's an attractive idea.

Is there a future for integrated voice and data?

Probably in the long term, but not soon. There are two reasons for this. One, there is little prospect for computer-based recognition of unstructured, continuous speech. Thus, there will be slow growth of voice processing in the same way data and text are processed. From a functional perspective, there is little reason to integrate the two. There are some interesting hybrid systems involving digitized voice mail services, combined with data and other encoded material interspersed in the stream. But early products like the Wang voice terminal show that this level of integration can be accomplished with separate voice and data networks.

The second reason is that everyone already has a satisfactory voice network: twisted-wire pairs and the PABX. It would cost money to take this network out and, since there is no functional reason to integrate it with coaxial cables for the data and text network, people are simply putting in a separate network for that purpose and leaving the twisted pairs alone.

Are you talking about a data network?

(Continued on Page 91)

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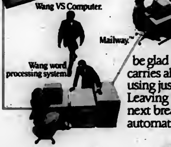

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Viewpoint

'I would say installing a local-area network right now seems to be premature.'

(Continued from Page 15)

access techniques, all of which combine to provide the basic elements of local-area networks.

This sounds like distributed processing, which moves a great deal of computing power into the user's hands.

I feel that many of the classical DP functions will be moved out of the DP department and distributed in the office, and this is a move in the right direction. I don't believe the DP manager should see that as a threat; it will relieve him of a lot of tedious data entry and data management and will give him constant feedback for what the user and the organization really need without guessing.

What technically can be done to prepare for distributed processing?

The simplest thing is that if a new building is being constructed, make sure that sufficient ducting is installed for whatever communications medium is to be installed.

What is the most popular medium?

That's a good question. Right now, there are three competitive technologies, with another looming in the future: baseband coaxial, broadband coaxial and twisted pair. The computerized branch exchange [CBX] operates on existing in-building twisted pair, and most buildings are wired suitably for this application. The fourth technology, of course, is fiber optics.

I should mention something else, which is a hybrid system. Datapoint, for example, has been very aggressive in this field. They allow a baseband local-area network to handle data, which is coupled into their CBX for mixed voice and other services. From the CBX you can connect into other, nationwide networks. Moreover, they have recently announced compatibility with the TRS-80 Model II, which allows for attachment of personal workstations as well.

Is twisted pair sufficient for most data transmission purposes?

Well, if you compare CBX performance of twisted pair for data with the two modes of coaxial cable, the answer very likely is yes. But the bottom line is economics. Broadband and computerized branch exchange are now in a serious battle for the greatest share of the market. Unfortunately, baseband seems to be the darling of the local-area net people, but it should fall into disfavor shortly. It probably will not be able to support a mixed service, namely data as well as voice, fax, video, graphics. For example, Ethernet becomes less and less efficient as bandwidth increases because the ratio of propagation delay to packet transmission time is the key parameter affecting its behavior.

What about fiber optics?

It is an exciting forthcoming technology, but it is three or four years away. The biggest problem is taps; it's not clear how to tap into or split a fiber-optic channel. But the advantages are enormous: bandwidth is in the gigabits per second, the error rates are minimal. It's immune to electromagnetic inteference and is more secure. Lower cost could ultimately make fiber optics the most desirable medium. Of course, one must factor in the costs of pulling a new medium through the wire ducts; the prudent organization should consider pulling a multiplicity of media at the time of the initial network layout.

When should a firm implement a local-area network?

That's a difficult question to answer, but right now I would say it seems to be premature. Every week we see a new offering at lower cost

(Continued on Page 93)

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(Continued from Page 15)

ple need and what kind of information you want, then determine what processing technology is best.

With the second option, communications, the needs are determined more by performance characteristics than by information flow. Digital techniques will allow better performance and will make integrating voice and data over common facilities much easier.

When you put these two technologies together, you end up with a wide range of possibilities. What that suggests to me is that these two complementary technical dimensions will create choices that can have a direct impact on business goals.

How does the DP manager decide how to use these two technologies?

He must understand what the company is really trying to accomplish. If the firm tries to determine a direction before it understands these two options and their capabilities, it may not include all the things it could do. Instead of computing being responsive only to operational needs by providing services and being a tool for cost-effectiveness, it can actually become a catalyst in determining the business' direction.

Can you give an example?

In most companies, a great deal of information is accumulated in the course of business, such as inventory, manufacturing, customer files, sales information, order processing snd the like. Your customers, suppliers, distributors or other companies might be interested in purchasing services or functions that use this information. This approach could generate revenue, facilitate sales or increase the company's ability to meet its customers' needs.

DP managers are usually pretty busy just keeping the computer operating; are they supposed to find ways to sell data, too?

Well, DP managers may be seeing too many demands on their time and services and an erosion of their control as computing becomes distributed. However, if they were to look upon themselves as more of a profit center, the company might regard them as a more valuable service.

Do you mean a profit center externally or internally?

Both. Instead of merely trying to keep up with a rapidly evolving technology, they could instead get funded at a level where they could manage it, lead it and create new opportunities.

There's a need to change the image of the data processing center as only an operating facility and make it more of a partner in forming business strategy. But to do that, the firm must place value on what the DP manager brings to the business — the technological options. And that value should be considered a form of profit for DP services. This means other departments must properly fund the DP center, since they are getting a product or a service from it.

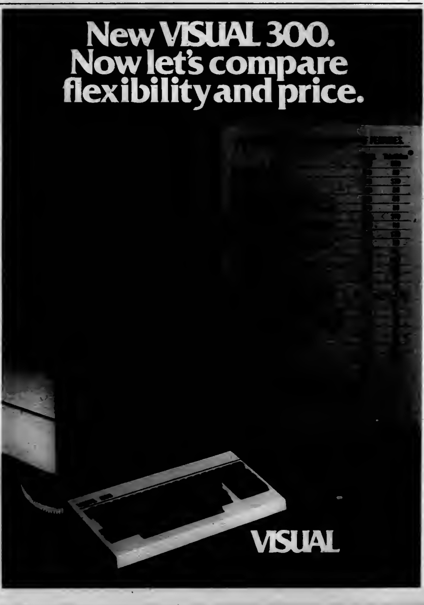
This seems like it would change the nature of the relationship between data processing and all the other functions in the firm quite dramatically.

Many companies have already done it and they have extensive business plans and strategies. These strategies, in many cases, are being implemented on an application-by-application basis and it's working fine.

Basically, it's a message looking at these technologies as opportunities rather than as problems. It's s message of expansion and of creating higher value for the technological services in the eyes of the people who request them. Being able to respond to business directions with ideas, rather than being a source of problems is certainly a more desirable role for the DP manager.

In some cases, such as the prolifera-

> ***'DP managers may be seeing too many demands on their time and services as an erosion of their control.'***



Viewpoint

The DP department's work should be value-added so it can be thought of as a profit center.

In some cases, such as the proliferation of microcomputers and electronic intercompany communications, the business strategy itself needs to be reexamined. If so, the DP manager — the information person — should be an integral part of that process, because a great deal of the business a company conducts three to five years from now will be inherently tied to these kinds of technology.

Are you saying the DP manager should relinquish control of the computer hardware, since it's becoming distributed, and begin managing the information instead?

I would like to characterize the approach as working with users to plan applications before they become emergency three-month projects. It's stimulating ideas and presenting pictures that go beyond what the user thought of initially. It's like developing a staff planning function, if one doesn't already exist, which is user-oriented and brings the technology to the user to create additional options.

Where do these ideas for new applications come from?

Well, they can learn from other companies, in their industry or in other areas, that have already taken advantage of the new technologies. Or they can build the expertise on an application-by-application basis.

This kind of application of technology to further business goals builds the DP department's prestige so that its work becomes more value-added and it can be thought of as a profit center.

Clearly, to change the image of the DP department, those in it must change their image of themselves. And the way to do this is to have some successes with various individual applications, one at a time — building a following, if you will. These successes inevitably will come to top management's attention. But first DP managers must begin to think that they belong in that role.

It sounds like the way to do that is with some strategic planning for the future.

That's right. Indeed, the firm must first decide what kind of business it wants to be in five years from now. Many businesses are dramatically changing the way they view their information and the way they view processing resources. They are realizing that their processing resources are not only internal support systems, but something they can sell to others or use to enhance their market positions for current product lines.

Many companies are active in their trade associations and in trying to find ways that intercompany electronic communications can be used to improve productivity and to provide information that will make their services more timely and useful.

In a nutshell, the future of most companies will be affected dramatically by technology. And rather than technology being a burden, it can be used as a catalyst and as an opportunity. The DP manager is in an ideal position to make this happen.

What are some of the key emerging technologies that will have an impact on a company's directions?

As an example, take protocols that allow more standard interfaces between devices. The standards bodies are moving from the physical line protocols to the higher layer protocols. The ISO and the CCITT seven-layer architecture work is moving toward trying to allow products to communicate with each other. Moreover, the same technology will eventually allow programmers to write application programs assuming that individual products will be consistent with the standard and then to decide how to apply the processing.

For instance, say we begin with the business plan. From the business plan we want to understand where and what kinds of processing should occur and how it should interact with people. Next we must determine the software requirements. Then, by selecting the best products that meet network protocol standards, a network of systems can be deployed. These may be shared or dedicated distributed products, desktop workstations or the mainframe down the hall in the computer room. The emerging protocol technology will lead to additional design choices and therefore support more varied and expanding business applications.

(Continued on Page 96)

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BELL'S NEW STRATEGIES FOR THE 80s

The Bell System, comprised of AT&T and its affiliates, is the largest and best known corporation in the world. The Bell System employs more than one million people and in 1981, accumulated revenues of over [illegible] billion and earned profits of nearly [illegible] billion. AT&T and the Department of Justice started 1982 in dramatic fashion by announcing the settlement of their antitrust suit. Under the terms of the proposed settlement AT&T will 'spin off' the 22 local Bell operating companies. These companies will provide intraexchange telephone service and local connections for all long-distance carriers including AT&T Long Lines. AT&T will retain ownership of Long Lines Division, Western Electric and Bell Laboratories and will continue the formation of the fully separate subsidiary (FSS) that will provide customer premises equipment and enhanced communications services.

By Christopher Mines

Bell has taken the initiative away from regulators and competitors and now controls its own destiny.

The antitrust settlement does not substsntially alter ongoing industry proceedings that were changing Bell's course from utility to competitive supplier. The separation of transmission provision from equipment sales, the equal treatment of long-distance carriers by local telephone companies and the establishment of a separate subsidiary by the Bell System were all happening anyway. The settlement will act as a catalyst for these developments, focusing user awareness on the Federal Communications Commission (FCC) and legislative proceedings that will implement the mandates of the Justice Department and the courts.

This article is not an analysis of the antitrust settlement, but rather a look at the new AT&T — a smaller but potentially much more profitable corporation. The FSS will lead AT&T into the promised land of data processing and data communications.

Corporate Mission

AT&T has changed its corporate mission from single-minded devotion to "the best telephone system in the world" to wide-ranging participation in the many different markets that compose the computer/communications industry. As AT&T Chairman Charles Brown said in the 1980 annual report:

"[1980] was a year in which we redefined the scope of our business and raised our marketing horizons. No longer do we perceive that our business will be limited to telephony, or for that matter, telecommunications. Ours is the business of *information handling, the knowledge business* [emphasis added]."

Why is Bell restructuring what is obviously a successful and thriving business? The traditional answer is that Bell is being restructured against its will by outside forces, such as the FCC, the courts and the competitive communications suppliers. It is now clear to most industry observers, however, that Bell has gone far beyond a defense of its monopolistic position and is now in the forefront of a restructuring effort. Bell has taken the initiative away from the regulators and its competitors and now, in large measure, controls its own destiny.

Bell is restructuring for two reasons: Its traditional telephone business cannot support the level of corporate revenues that AT&T needs to satisfy its stockholders and maintain its dominant financial and technological position, and, as a corollary, Bell sees opportunities to exploit its existing plant and communications technology in new, more profitable markets.

The market for traditional voice communication services is near saturation, growing only 4% to 5% per year. New telephone installations by the Bell System barely keep pace with population growth and inflation. For every seven new phones installed by Bell, six are taken out. Looking not too far into the future, Bell System planners can see the flattening of traditionsl telephone service revenues, which have been growing steadily in the postwar era.

Competition is also having an impact on Bell Syatem revenues.

Over the last 15 years, various portions of the Bell System have watched their monopoly position disappear as new, innovative firms made successful entries into the telephone and communication business. A series of FCC and court decisions, starting with the landmark Carterfone decision in 1968, have given birth to several totally new industries, including "interconnect" telephone and switching equipment, specialized common carriers and value-added network services.

The companies that participate in these fields all target Bell as their main competitor. They concentrate on the most profitable areas of Bell's business and, in many cases, have successfully siphoned pieces of Bell revenue. Switched long-distance and Wats telephone service are the two most profitable segments of AT&T's business, representing more than 45% of AT&T'a 1980 revenue (approximately $23.5 billion).

Although AT&T Long Lines currently carries about 98% of all the long-distance transmission traffic in the U.S., competing carriers are chipping away at this market share, which will drop to 93% by 1985. Most companies competing in this market are small, but they are making a significant impact on Bell'a future plans. Long Lines, the traditional money generator for the Bell System, is most clearly threatened.

These factors have combined to put AT&T in an untenable financial position. The Bell System is asset-rich, but cash-poor. The telephone business is labor- and capital-intensive. Even with 1981 revenues of over $57 billion, the Bell System must borrow $1 billion every 90 days to keep its financial head above water.

Of course, Bell has no problem going to the bond market for financing, but the long-term effects of its growing indebtedness are harmful. As interest rates maintain their high level, it becomes even more of a strain for Bell to borrow large amounts of capital. The Bell System owns more than $125 billion in installed plant (telephones, lines and cables and switching equipment), most of it overvalued (by approximately 30%) and underdepreciated in today'a fast-paced technological environment. To meet competition, Bell is faced with the prospect of upgrading much of its installed network equipment before it has realized the full economic value of the equipment.

In terms of actual cash flow, Bell has insufficient profits to make new capital investments in broadband transmission facilities fast enough to meet competition from satellite carriers and others.

To earn a better return on its investment dollars, Bell must move into new markets that are growing faster than telephone service and must be able to sell competitively with other participants in those markets. By divesting the local operating companies, AT&T is shedding approximately 80% of its assets, which frees up the rest of the corporation to concentrate on more profitable arenas. AT&T has a sales:employee ratio of about $50,000:1. The electronics industry as a whole averages closer to $80,000- to $100,000:1. The FCC and the courts have opened up the telephone market to Bell competitors; conversely, new markets outside of telephony are being opened to Bell, including data communications, value-added transmission services, customer-premises equipment and the home information market.

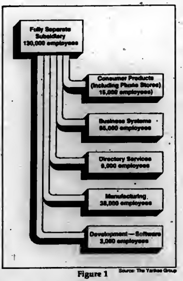

Fully Separate Subsidiary 130,000 employees
Consumer Products (Including Phone Stores) 15,000 employees)
Business Systems 65,000 employees
Directory Services 9,000 employees
Manufacturing 38,000 employees
Development — Software 3,000 employees

Figure 1

Source: The Yankee Group

The overall trend in the regulatory arena is clear: Bell, through a separate subsidiary, will be competing on equal terms with other suppliers in the communications equipment and enhanced communications services markets.

A separate subsidiary (known variously as the Fully Separate Subsidiary, Fully Separate Affiliate and Baby Bell) will be formed over the next aix months. It will be the bridge to new unregulated equipment and services markets Bell will be entering. The subsidiary is mandated by the provisions of the Second Computer Inquiry, an FCC proceeding that establishes the rules for regulation (and deregulation) of the communications industry. The Senate version of the Communications Act Rewrite, S. 898, is in substantial agreement with the approach originated by Computer Inquiry II.

Through the subsidiary, AT&T will sell equipment and enhanced services competitively with other suppliers, rather than lease them under tariff regulation by the FCC and state utility commissions. The subsidiary'a product line will include:

Data and voice communications equipment of all descriptions:

- User-friendly terminals — for dats and voice — for home and business use.
- Facsimile terminals.

- PBXs and other switching processors.
- Intelligent local networks for intrabuilding communications.
- Advanced modems and multiplexers.
- Packet-switching processors for private networks.

Enhanced communications services and software:

- Packet-switched data communications networks for electronic mail and remote data base access.
- Decision-support systems and other advanced software packages.
- Energy management software.
- Software for financial transaction processing and other industry-specific software products.

In short, the Bell separate subsidiary will be in just about every niche of the computer/communications industry. It will not be selling mainframe computers or associated general-purpose peripherals. The projected organization of the subsidiary is shown in Figure 1.

Many of the products mentioned above will be grown out of current Bell System products like Teletype terminals or Dataphone modems; others will be newly developed for the unregulated markets. Low-end, user-friendly products like data/voice terminals will be marketed through direct retail outlets, progeny of the Phone Center stores of today. More advanced products and services will be sold directly to business users in a total systems environment.

In the Beginning . . .

Obviously, the new subsidiary will not be ready to offer all these products and services on its first day of operation. One of Bell's biggest problems has always been getting its research and development efforts out into the world fast enough to respond to changing market conditions. The transition to a dual-mode corporation — part competitive, part regulated utility — initially will not help the overall product development effort.

Only after the transition period of perhaps five years is over and both sides of the Bell System are fully operational will the subsidiary be able to expand its product line and bring its technological expertise fully to bear on the marketplace.

The subsidiary will start out slowly. Bell will have plenty of problems, both internal and external, to work out as the subsidiary begins operation. The subsidiary will have more than 100,000 employees at first, which creates enormous logistical problems for the Bell System. Problems such as personnel transfers, building new facilities or converting old ones are exacerbated by uncertainty about the subsidiary's exact nature.

Computer Inquiry II, the most definitive word on the subject so far, said nothing about the exact degree of separation from the parent corporation: for example, whether the subsidiary can use the AT&T or Bell name and logo or whether employees can be transferred back and forth between parent and subsidiary.

Another internal consideration in starting the subsidiary will be people. The subsidiary will start out as basically a marketing organization. The Bell System is traditionally weak in marketing, despite a crash recruitment and reeducation effort over the last three years. The subsidiary will be looking for salespeople who are experienced in the computer/communications industry. To find them, it will have to change the marketing structure used in the Bell operating companies and Long Lines to resemble more closely the traditional marketing-oriented companies.

The recruitment of Arch McGill, former IBM vice-president now in charge of business marketing for AT&T, is an event that must be repeated hundreds of times at lower levels of the organization before the subsidiary can begin to market head-on against the large computer vendors.

In addition to internal staffing and logistics problems, the Bell subsidiary will have to deal with external problems. The new company will undoubtedly tread lightly in the marketplace during its first two years, for fear of arousing regulatory and competitive suspicion (or worse). Competitors have regularly filed with the FCC and Congress their nervousness about the potential for subsidization of unregulated products with profits from monopoly telephone services.

In fact, many have claimed that telephone rate-payers are subsidizing the development of competitive Bell products before the subsidiary begins operation. The subsidiary must avoid any appearance of cross-subsidy, whether or not it exists. The FCC will be relying on competitors to blow the whistle if they suspect the new subsidiary is underpricing its products to undermine competition, and Bell's competitors will undoubtedly not hesitate to do so.

For exactly this reason, the Bell subsidiary will never be price-competitive with other vendors in many market segments. It will maintain prices that are slightly (5% to 10%) higher than those of the competition and hope to win market share on the basis of better service, reliability and product ease-of-use.

First Priority

The first priority of the subsidiary will be customer premises equipment. Under the terms of Computer Inquiry II, new customer premises equipment (that sold after the establishment of the subsidiary) will be detariffed and become the property of the subsidiary on Jan. 1, 1983. The subsidiary will eventually have responsibility for service, installation and sales of all customer premises equipment, old and new. Right from the start, this is an $8 billion-a-year business, or about 15% of total Bell System revenues.

The subsidiary's sales force will want to halt Bell's declining market share in PBXs, modems and other existing Bell CPE products. Marketing and service will be the initial two-pronged thrust.

Because of this, the subsidiary will adopt the strategy of private-labeling products manufactured by other suppliers. In fact, the subsidiary may well become the largest OEM PBX seller in the world. The new Bell company may move into non-Bell territory, selling to customers of independent telephone companies. (Of course, this will be accompanied by a countermove by the independents and their distributors into Bell territory.) The subsidiary's private-labeling strategy will be a wel-

FSS may become the largest OEM PBX seller in the world.

CRUCIAL ELEMENTS OF TELECOMMUNICATIONS

Crucial Element / Company	Transmission			Network Services		
	Intrabuilding	**Intracity**	**Long Haul**	**Communication Processing**	**Data Processing**	**Network Control, Management**
AT&T	existing phone wires/PBX "intelligent wire"	existing/ upgraded local loops	Long Lines — DDS — Satellite	ACS	ACS or separate service	ACS
IBM	SDLC loop or other local network	?	SBS	SNA (limited)	service bureau	SNA
GTE	PBX	existing local loops	GTE Satellite	Telenet	GTE Information Systems	Telenet
Others	"Wangnet" Datapoint ARC M/A COM — DCC	cellular radio CATV DTS microwave	MCI SPC RCA Satellite Western Union Satellite Comsat	Tymnet Uninet X.25 nets, public, private	GE Sun Tymshare service bureaus	Private nets from computer vendors, VANs

Figure 2

Source: The Yankee Group

Bell must shift its focus from transmission facilities toward the user interface.

come change for the general-trade PBX suppliers that have been trying for years to crack the Bell System market. These suppliers will find themselves production-constrained, however, and may discover that a big contract with the Bell subsidiary fades to nothing after its manufacturing capabilities are fully in operation. A general-trade supplier that gears up its manufacturing to meet a large Bell order may find the new plant idle after two or three years.

Another sales strategy of the new subsidiary will entail a strong move into retail selling. The Bell System already has a nationwide chain of 1,800 Phone Center stores, currently used for residence customers to sign up for service and pick up telephone equipment. These Phone Centers are potential retail outlets for customer premises equipment of all kinds, from basic telephone handsets to low-end data terminals to facsimile devices, for both residential and business customers.

The concept of customer installation, firmly planted in the public mentality over the last five years, will expand to include complete customer responsibility for ownership and service of telephone equipment. This retail store strategy is also being pursued by IBM, Xerox Corp. and other computer and office equipment vendors as they look for an alternative to the high overhead of direct sales. The retail store can also become a service center, with phone-in and walk-in customer service for retail products.

By concentrating initially on marketing and service, the subsidiary will be able to build up its customer base. Even if it is gained by selling products manufactured by others, a large share of customers will be the new subsidiary's strongest asset. Customers are less interested in a product's manufacture than they are in its performance, reliability and serviceability. When the manufacturing operations of the subsidiary do gear up, it will already have a large user community that looks to it for communications equipment.

And on the Second Day . . .

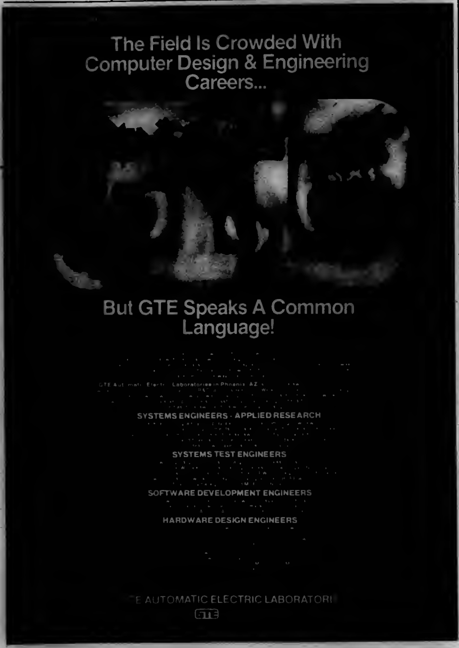
As the subsidiary begins to manufacture and market a full line of data and communications processing systems, it will target the portions of the market where Bell System technology and expertise will give it a significant advantage.

Presently, the Bell System represents only a transmission supplier for most large data processing users. Communications between host computers and remote sites is done over the Bell network, usually through a combination of dial-up and private-line transmission facilities. In some cases, customers are using Bell products such as Dataphone II to do network control and switching functions.

Bell will look to shift its dominance from the transmission facilities layer toward the user interface layer of network systems. To do so, the subsidiary will have to develop a strong systems approach to selling. For example, an advanced workstation terminal for network access and applications processing will have to be backed up by other peripherals like printers and storage devices. These terminal products probably represent the highest potential profit for Bell, since many of them can be sold either in a retail environment or as part of a system, where the individual profit margin can be multiplied by a large number of unit sales.

But these kinds of products, once the subsidiary begins selling into the office environment, will require a Bell local network solution to tie them together, as well as a communications processor to act as the gateway into outside networks. Bell's strength against competition like Xerox or Wang Laboratories, Inc. will be its communications expertise and its ability to sell a product line with a number of different alternatives to fit customer requirements.

The enhanced network services market will be the Bell subsidiary's next target. In 1981, this market is approxi-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ately $150 million; too small even to be noticed on an AT&T balance sheet. The market is growing by about 100% a year, but it will be 1985 before it becomes a significant factor in the growth of the subsidiary.

The introduction of the Advanced Communication Service (ACS), which was "reannounced" in December 1981 after two-and-a-half years of dormancy, will be the subsidiary's first toe in the enhanced services waters. ACS will expand slowly, probably reaching 10 cities by the end of 1982. Eventually, ACS will be the dominant public data network, surpassing Telenet Communications Corp., Tymnet, Inc. and others that will enter the market.. This market is growing so fast, however, that the competitive packet-switched networks will still fare well, even after ACS is firmly established.

Market Entrants

Entrants into the value-added network market will come from both sides of the spectrum. On the left side of the spectrum are the common carriers like AT&T, MCI Communications Corp., Satellite Business Systems (SBS) and others. These companies have extensive voice and/or data transmission facilities already in place and are seeking to expand their range of services. They can add value to their own transmission networks, just as the value-added carriers do today. The incremental cost of adding data facilities to a voice network or of adding enhanced communications processing functions to a data network is very small compared with the investment these carriers have in their transmission facilities.

For example, MCI has an extensive microwave-based voice network that competes with AT&T Long Lines in providing long-distance telephone service. The network could easily be modified to provide "data under voice" transmission service, as does Bell's Dataphone Digital Service (DDS). Another example is SBS, which could provide protocol conversion and other enhanced data services in the form of additional software for its existing satellite communications controllers. These carriers, and possibly others, will be in the value-added data network business within two years.

On the right side of the spectrum are time-sharing service bureaus, which provide a whole range of data processing services. Two of these, Tymshare's Tymnet and United Computing Systems, Inc.'s Uninet, have already entered the value-added network market. Providing communications services for remote users is a natural extension of the service bureau business; in fact, Uninet was already in place for internal United Computing customers for 10 years before it was made available for public use. Other service bureaus, particularly GE Information Services Co., could easily position themselves in the value-added business.

IBM is also a potential entrant in this market, through its distributed service bureau that many observers expect in 1982. IBM already has an extensive internal communications network that will form the basis of its time-sharing services. IBM also will lease high-speed data links from its SBS affiliate for users requiring service bureau processing at widely dispersed locations. The IBM network will eventually become a true public data network, offering terminal-to-user host connections and terminal-to-terminal services like electronic mail.

The data communications market, growing at 35% to 40% per year, presents an attractive opportunity for Bell to use its installed base of transmission and switching equipment more profitably. But the move will not be without risks for AT&T. This market has always been a highly competitive one, not subject to regulation. The major entrants are the most successful computer and communications vendors in the world. The Bell subsidiary will be taking on the likes of IBM, plus a host of aggressive smaller firms with years of experience.

The strategy will be to

In time, ACS could become the dominant public data network.

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No one vendor can provide all the advanced communications services needed today.

avoid broadside confrontations with these vendors and, instead, to concentrate on market segments where its communications expertise gives it a significant advantage. Communications processing gear (like multiplexers and packet switches) and local networks are the two market segments in which Bell will be able to leverage its vast voice communications experience into a tangible competitive advantage.

Prospects for Bell in 1985

There are six crucial elements in supplying advanced telecommunications systems for computer and communications users in the 1980s:

- Intrabuilding transmission facilities (local networks).
- Intracity transmission facilities.
- Long-haul transmission facilities.
- Communications processing.
- Data processing.
- Network control, management.

The first three elements can be provided through a number of different media, but must be wideband digital facilities, both along the transmission links and in the switching nodes. The other three elements are communications network services for providing device-to-application interconnection. Communications processing includes data manipulation before, during or after transmission for the purpose of improving communication efficiency. Functions like protocol and code conversion, digital-to-analog conversion and message store-and-forward are all communications processing.

Data processing, on the other hand, entails providing computer facilities and software for solving applicationsproblems. In the context of telecommunications services, data processing can be done either through remote time-sharing or by down-line loading applications software into local processing nodes.

Network control and management functions provide information about the usage of network facilities and tools for diagnosing faults, changing network configurations and so on.

Only the largest computer and communications vendors will be able to supply these six elements on an integrated basis. No one company can provide them all today.

Figure 2 on Page 23 represents my estimate of major participants providing integrated telecommunications services in 1985 and the product supplying each of the six elements. The chart is not meant to be an exhaustive list of the products that can make up a network system, but is rather an indication of the breadth of the product line of some major computer and communications vendors competing with AT&T in 1985. Some of the products or services shown are not announced or implemented, but represent projections of the vendors' future plans.

AT&T is obviously strong in transmission facilities. Even with the operating companies' local loops now at arm's length organizationally, AT&T will still dictate the technology and network planning used in the loops for at least five years. AT&T also has existing "local networks" in most offices, through telephone wiring and a large share of the PBX market. The problem for Bell is twofold:

- Increase the bandwidth and functionality of these transmission facilities.
- Add value to the core network with enhanced communications services.

Bell is part way toward accomplishing the first task with T-1 digital links and digital ESS switching nodes, but the complete "digitization" of the network, especially at the local and in-building level, is many years away.

The second task is clearly the target for ACS, which is planned as an all-encompassing solution to network services. Bell's overriding strategy, as befits a company this size, is to bring its advanced products along slowly, keeping the integrity of the network intact as its functionality expands. In the meantime, however, other vendors are positioning themselves to offer complete telecommunications services, in many cases bypassing the facilities of the Bell System.

IBM is probably in the best position to challenge AT&T's dominance in telecommunications. As shown in Figure 2 on Page 23, it has a current or planned entry into most of the crucial market segments. In addition, there is no lack of other participants in each segment, some of which are shown in the "Others" section of the chart.

Bell will be facing competition not only from the well-established computer and communications vendors, but also from small, innovative firms applying new technologies to the communications-based applications that form the basis of advanced information processing systems.

Christopher Mines is a senior analyst for telecommunications industry with the Yankee Group in Boston.

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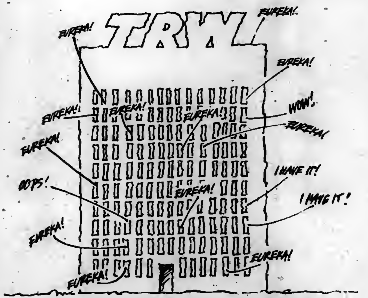
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[illegible] satellite [illegible] [illegible] NASA [illegible] [illegible] President [illegible] Kennedy [illegible] signing the U.S. Communications Satellite Act which established Comsat Corp. [illegible] U.S. [illegible] research [illegible] [illegible] consortium pledged to [illegible] and operate a global network of communications satellites. Now after less than 20 years domestic satellite communications is poised for strong resurgence. There are 12 satellites [illegible] with 17 more scheduled for launch [illegible] the next four years [illegible] and only seven replacement birds. Where once [illegible] companies dominated the domestic satellite skies, now [illegible] fast [illegible] [illegible] act. Heretofore primarily a medium for television and voice carriage, satellite communications is beginning to look attractive to business applications. Satellite Business Systems (SBS) has been [illegible] the imagination of businessmen [illegible] and [illegible] for the better part of the decade. Two new carriers, Hughes Communications [illegible] and GTE

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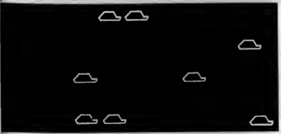

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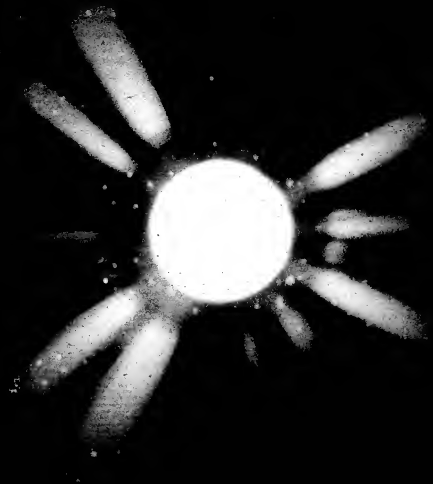

'Satellite systems are equipment- and technology-intensive, and at the mercy of a hostile environment.'

Satellite Corp. (Gsat), plan to follow suit.

For companies with dispersed facilities, satellite communications can save money in the transfer of both voice and data. And video conferencing, not yet even in the embryonic stage, is a potentially explosive application.

But satellites are not a panacea. They compete with an excellent terrestrial telecommunications network run by AT&T, independent telephone companies and specialized common carriers. And, although it is true that they can cut costs for some telecommunications users, they are not direct substitutes for land-based lines.

Inherently, satellites are appealing because of their multipoint broadcast ability and because of the wide bandwidth they offer. But to use these attributes efficiently, users must consider many factors: delays, protocols, uptime (satellites are susceptible to many natural phenomena that land lines are not), costs, location and even susceptibility to sabotage and war.

Quite often, because satellite systems are sometimes accessed through the ground network, the sundry problems and inefficiencies of copper-pair transmission will also be built into end-to-end satellite transmission. These include error rates, costs and maximum speeds available.

Intelsat System

Intelsat launched its first satellite in 1965. It was 28.4 inches in diameter, 23.2 inches high and weighed 85 pounds in final orbit. It could carry 240 voice circuits or one television channel.

Today, the Intelsat system connects 260 earth stations in over 130 countries. Intelsat V satellites, the latest generation, have 51-foot wingspans, stand over 21 feet high and weigh 2,286 pounds in orbit.

They can carry 12,000 simultaneous telephone conversations plus two television channels — more than 50 times the capacity of Early Bird. Intelsat handles about two-thirds of all transoceanic traffic.

Satellite Systems

Satellite systems are equipment- and technology-intensive — and at the mercy of a hostile environment.

Not only must satellites reach and inhabit outer space, but transmissions must also cope with atmospheric hazards like storms, rain, fog, snow and hail. In addition, transmission must cross spaces laced with other radio waves.

Satellite transponders are small power amplifiers that interact with the signals received from earth, change their frequencies and shoot them back to earth. The number of transponders that satellites carry varies, but most modern satellites carry 24, each with a bandwidth of 36 MHz.

Each transponder can be subdivided into a number of channels. The more channels per transponder, the lower the overall achievable transmission speed. One transponder is generally used for one of the following:

- One television signal with accompanying sound.
- 1,200 to 1,500 simultaneous two-way voice channels.
- A data rate of 50M bit/sec.

For data transmissions, channel capacity can be redistributed — for example, one transponder can be used for 600 channels at 40K bit/sec.

System Delays

In order to be geosynchronous, satellites must orbit the equator at 22,300 miles. Any signal making the earth-to-satellite-to-earth journey travels more than 44,000 miles — 14 times the distance of a transcontinental terrestrial transmission. Even at the speed of light, that takes over a quarter of a second (270 msec).

This delay has differing effects on traffic:

- Video — little effect. Propagation delays typically have little effect on cable TV, the prime video user of satellites, because of the receive-only (one-way) nature of their business. It does not matter much if programs reach users 270 msecs later than when they were broadcast.
- Voice — more effect. A two-way voice conversation will experience half-second delays because a user will have to wait until his last phrase has reached the other party, and an additional quarter of a second for the other party to answer.
- Data — strong effect. Because machines interact at much greater speeds than humans, satellite propagation delays can seriously degrade their communications. Check-back protocols, such as IBM's bisync, are mostly useless: for every few blocks of data the end point receives, it sends back an acknowledgement and reports the number of blocks that need retransmission due to errors. A few errors will cause multiple retransmissions, seriously degrading throughput. (Even IBM's efficient SDLC protocol is not very suitable for satellite transmission.)

Thus satellite channels cannot be substituted indiscriminately for land lines. This is an important rule to remember. Proper protocols and control devices must be used, otherwise response time could become worse than with land-based alternatives.

Today's Players

Four carriers have domestic communications satellites in orbit today: Comsat General Corp., Satellite Business Systems, Western Union and RCA American Communications (RCA Americom). The 1981 launch of Comsat General's fourth satellite, SBS' second bird and RCA Americom's third satellite late in the year (replacing the one it unexplainedly lost in 1979), brings the total number of in-orbit satellites to 12.

Four new carriers have the Federal Communications Commission (FCC) green light to launch satellites of their own. Of those, only AT&T has previously orbited its own birds, though some of the others, like Hughes, have been building satellites for years.

According to Roger Cochetti of Comsat General, Comsat General's Comstar system consists of four satellites, each with 24 34-MHz transponders and an expected life span of seven years. When D-4 was launched in February 1981, the system's capacity was not increased as it would at first seem likely. Instead, D-1 and D-2 were slid into the same orbit to "colocate," and some of their traffic was off-loaded onto the newer birds. This will extend the useful life of those satellites, which are in the graying years of their seven-year life span.

The two active Comstar satellites are used predominately by AT&T and GTE (at $1.3 million per month per satellite) for general telephone traffic. Both phone companies own earth stations; AT&T owns four and GTE, three. Because each company occasionally uses the other's ground facilities, figuring out who owes what to whom is a monthly chore.

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The Comstar satellites are "Centaur" satellites, larger than conventional birds and requiring Centaur rockets to launch. (A Centaur launch costs more than $40 million, a Delta rocket launch more than $20 million. The National Aeronautics and Space Administration's (Nasa) Space Shuttle will be able to put satellites in orbit for roughly $8 million.)

The Comstar Centaur satellites can each carry 18,000 simultaneous two-way voice conversations.

According to Rich Meyer of AT&T Long Lines Division, D-3 and D-4 have a total of 36,000 two-way voice circuits. Of these, 25,000 circuits are used for the commercial voice services of MTS and Wats and a "handful" of circuits are used for government private lines. The colocating D-1 and D-2 act as backups only. Today, 11 transponders on D-1 and D-2 are leased to RCA for video services.

AT&T is studying new markets and recently petitioned the FCC for permission to use its satellite capacity for high-speed data and television distribution.

On Sept. 25, 1981, the FCC granted AT&T permission to provide television distribution with its leased Comstar satellites, but there hasn't been any ruling on data yet. The stakes are different. Whereas RCA and Western Union may not relish another player in their field, they are more than capable of competing for the television business. On the other hand, the implications of AT&T's offering high-speed digital services, with its vast complementing ground network, are staggering. The FCC will likely be cautious when considering that proposal.

Satellite Business Systems

SBS is the nonstandard vendor. Its intent to cater exclusively (or at least mostly) to business communications sets it well apart from the carriers discussed so far. SBS' is a novel approach — a rather brave undertaking. For its gumption, it has accrued a number of industry firsts:

- SBS is the first and only all-digital system for business communications of data, voice and video, directly from the rooftop of one organization to the rooftop of another.
- It is the only satellite vendor that can offer this service in all locations — even microwave-congested cities — because it is the first vendor to operate a 14/12 GHz or K-band satellite.
- The transponders on SBS' satellites are the most powerful satellites among the domestic birds, which allows for the use of some of the smallest dishes being used commercially today.
- Because all SBS traffic is digital, the system is the first to use Time Division Multiple Access (TDMA) exclusively.

The initial service SBS provided was its Communications Network Service (CNS). "A typical CNS customer has geographically dispersed facilities with large volumes of communications among them. At present, most of this intraorganizational communications is in the form of telephone conversations. Other communication applications — such as document distribution, data transfer and video teleconferencing — are comparatively minor in scope. But these are expected to grow sharply as facilities become available for more economical, higher capacity transmission," according to an SBS document.

CNS was originally offered in one version only. It was for large users that could justify having dedicated earth stations installed on their premises. It required a minimum of three customer earth stations.

Later, to lower the entry costs of smaller customers, SBS refiled the tariffs, adding a provision for smaller organizations to share facilities. This was CNS-B.

With CNS-B, the ground segment of the SBS system is shared by two or more customers with lower volume communications needs. CNS-B service also specifies the use of at least three earth stations (or two stations and a service point), but limits expansion to five stations.

The shared facilities plan dropped the monthly recurring charge from the $12,500 per station in CNS-A, to $7,500 in CNS-B.

DTS Proposal

To make the system available to an even larger user pool, in August of 1981 SBS asked the FCC for authority to build and operate a digital termination system (DTS). The Data Exchange Service (DXS — SBS' version of DTS) would, in the words of SBS' president, Robert C. Hall, extend SBS' "solution to the communications needs of medium and small users."

DXS is similar in scope and operation to the eight proposals filed by other DTS hopefuls. SBS' proposed "extended" network (serving over 30 cities), like those of the other companies, would use 10-GHz microwave frequencies for communications between customers' on-site two-foot diameter antennas and the nearest node in their honeycomblike "cell." These network nodes are spaced between six- to 10-mile intervals with at least one node in every key city poised near an SBS earth station providing a long-haul connection.

Three of the nine DTS contenders, SBS, Tymnet, Inc. and Local Data Distribution Co. (LDD) — a M/A-COM, Inc./Aetna joint venture — may be ahead of the game because of joint development and experimental work they have done together.

In a recently concluded experiment, which was heralded as a great success by the three companies, the system was used to link participating companies (including Itel Corp., Control Data Corp., Merrill, Lynch, Pierce, Fenner & Smith and others) in New York and San Francisco. SBS provided the satellite trunk for the system, Tymnet offered central node facilities, LDD supplied the radio equipment and the cable systems of Manhattan Cable in New York and Viacom in California were used where line of sight was not feasible.

Voice Message Services

Although it is possible to switch voice with DTS, it is not economical. Although DTS made SBS' digital services viable to a larger user base, SBS still lacked any supplemental voice services for the smaller user. On Nov. 4, SBS filed tariffs with the FCC for a switched voice communications service with early 1982 as its target date.

The services will be economical to users with "relatively high-volume calling requirements," representatives said. Dedicated lines will be used to connect customers to the nearest possible SBS earth station. Future plans call for interconnection with local telephone companies.

Customers using access lines will be charged a one-time installation fee of $105 and a monthly charge ranging from $20 to $80. Per-minute usage charges range from 20 cents to 34 cents, depending on destination and call volume.

The services, SBS said, are "an economical alternative to existing long-distance services ... priced below Wats."

SBS' planned system includes three 14/12 GHz K-band satellites. Its second satellite was launched this year on Sept. 24. Each SBS satellite has 10 transponders, which is, again, different from the usual 12 or 24 carried by most. But SBS transponders have a 43-MHz bandwidth. As mentioned, the SBS system is all digital and the only one to use TDMA exclusively.

Higher Data Rates

The wide bandwidth means higher data rates can be sustained. Add to this the fact that with TDMA each user can access the total bandwidth of a transponder, if only for a fraction of a second (which creates an appearance of a virtual circuit), and the impressiveness of the total capacity begins to become clear. In fact, each

> ***'The implications of AT&T's offering high-speed digital services . . . are staggering.'***

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Discover The Advantage

Western Union was the first U.S. company to develop and deploy its own commercial satellite system.

SBS satellite can support a data rate of 48M bit/sec per transponder, with a total throughput capacity of 480M bit/sec per satellite.

As of this writing, SBS has signed 22 CNS customers, 17 of which are public knowledge. Only three customers, IBM, Boeing Computer Services Co. and Insurance Systems of America Communications, Inc. (Isacomm), are presently using the system.

Voice and data make up most of the traffic of today's users, but Allstate Insurance Co. intends to use satellite teleconferencing (another SBS service) in the near future. Apparently, most customers are implementing one type of service at a time. For instance, IBM is using the system for voice communications only, while Isacomm, which resells the capacity to its member insurance companies, reports that Wausau (a part owner of Isacomm) will use the system for high-speed data communications only.

Boeing Computer Services has three earth stations in place already; IBM and Isacomm have six. SBS anticipates installing 60 more earth stations by the end of 1981 and 100 more by the end of 1982.

Western Union

Although it is convenient to mention SBS and AT&T close on the heels of Comsat — all are aware of each other's accomplishments — Western Union really deserves second seed; it was the first U.S. company to develop and deploy its own commercial system.

Western Union has three satellites in orbit today: Westar I, Westar II, and Westar III, which was launched in August of 1979. As can be expected, Westar I and II are nearing the end of their expected life, but Western Union has FCC authorization to launch Westar IV and V in 1982. These satellites will have 24 transponders; I, II and III had only 12. In addition, Western Union has applied to the FCC for authority to build Westar VI, another 24-transponder satellite.

In 1979, Western Union sold American Satellite Corp. a 20% ownership interest in Westar satellites I, II and III, and in IV and V when they are launched. American Satellite is owned jointly by Fairchild Industries and Continental Telephone Corp.

In addition, American Satellite has dibs on part of the Tracking and Data Relay Satellite System (TDRSS); according to Western Union:

"Pursuant to the 1979 agreement, Fairchild and Continental each acquired a 25% interest in Space Communications Co., which is building the Tracking and Data Relay Satellite System (TDRSS) that will provide Nasa with increased coverage of low-orbiting space vehicles. The remaining 50% ownership of Space Communications Co. is held by Western Union Space Communications, Inc., a subsidiary of Western Union Corp."

TDRSS, the first satellite of which is scheduled for launch in 1982, will eventually consist of four Advanced Westar satellites, Western Union's second generation of satellites.

TDRSS-A and TDRSS-B, as the first two satellites are known, will be dedicated to Nasa and launched in 1982 and 1983 respectively. TDRSS-C, to be launched in June of 1984, will be an orbiting spare to back up the first two satellites and the fourth, the Advanced Westar, which will be shared by Western Union and American Satellite and which is also slated for a 1984 launch.

Western Union had its start as a broadcast carrier and today continues to fancy itself as that, though it does support transmission of voice and data for broadcast industry users.

Newer fare of the Westar system includes the distribution of print media via facsimile techniques. The *Wall Street Journal* uses Westar for regional printing of its paper, and both text and pictures for *U.S. News & World Report*, as well as *Time, People,* and *Sports Illustrated* magazines are transmitted by satellite.

Transponder time is also leased to companies for video conferencing. Texas Instruments, Inc., for one, leased transponder time to broadcast its 1980 and 1981 annual stockholders' meetings from company headquarters in Dallas to 22 of its company sites.

Private-Line Services

Regardless of its broadcast image, Western Union is leaning into the private service market with a number of different offerings, including:

- Space Tel — a metered private-line voice/data service providing point-to-point connection in an 18-city network.
- Metro 1 — long-distance Wats/MTS-like telephone service connecting Western Union's microwave grid with the Westar satellites.
- Point-to-point data transmission — wideband data communications service between dedicated, Western Union-provided earth stations, or customer-owned stations on users' premises 56K bit/sec and above.

The Advanced Westar satellites that will make up the TDRSS "galaxy" (group of satellites) will likely be the first hybrid satellites (operating in both the C, 6/4 GHz, and Ku, 14/12 GHz, range) in orbit.

They will weigh 5,000 pounds in orbit (Early Bird weighed 85 pounds and even Intelsat V only weighs 2,200 pounds), and measure in at a staggering 57 feet by 42 feet.

American Satellite

American Satellite is a specialized common carrier that uses its 20% ownership of the Westar galaxy to provide a number of services:

- Common carrier circuits — American Satellite provides circuits between 30 sets of cities on a 30-day cancellable basis using four major earth stations (in Dallas, Los Angeles, New York and San Francisco). Both microwave links and telephone local loops are used to connect customers to central American Satellite sites. There are plans in the mill to add 15 additional cities to the network. Traffic can be voice or data (to 9,600 bit/sec on a single voice-grade circuit), or facsimile or video.
- Shared FX — Businesses in Chicago, Los Angeles, San Francisco, Dallas, Houston and New York can use American Satellite's facilities from one of these locations to communicate with a local point in one of the other five cities. Circuits can be shared with up to three other customers to optimize savings.
- Satellite Data Exchange (SDX) — Originally, corporations that wanted the SDX service and the related dedicated earth stations had to put the 33-foot-diameter antennas next to their facilities. Today, like the other direct-to-premise organizations, SDX can be used with five-meter rooftop antennas (as long as there is not too much microwave congestion in that area). SDX can be used in conjunction with the common carrier circuits, so that if a company is located near one of American Satellite's cen-

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tral offices, it may have to spring for only one or two remote SDX stations to form a network.

Apparently, 20%-ownership interest in Western Union's satellites is too fragile for American Satellite's taste. It recently announced its intention to file for permission to launch its own bird and it placed a $100,000 launch reservation fee with Nasa.

RCA Americom

The systematic growth of RCA American Communications, Inc. (RCA Americom) received a severe blow in 1979 when it lost contact with Satcom III a few days after launch. The company was able to paper over the hiatus in lost capacity by quickly making arrangements to have the 11 CATV vendor contracts it had procured prior to the launch use transponders in the Comstar system.

As of this writing, RCA still leases those transponders from AT&T. And, according to John Williamson of Americom, the 11 CATV vendors presently using the Comstar birds through RCA will continue to do so until Satcom IV is launched in 1982.

The RCA system includes the aging Satcom 1, II and now IIIR, each of which has 24 36-MHz transponders. The FCC has OK'd 1982 launches of Satcom IV and V and RCA has requested an August 1983 launch for Satcom IV.

RCA Americom's 56 Plus data service is derived from capacity on Satcom II. It is aimed at the business communications market, offering 56K bit/sec circuits to users that can either support their own earth stations or are close enough to an RCA earth station to use it.

RCA claims that one of its coast-to-coast 56K bit/sec circuits would cost 15% less annually to operate than a similar Dataphone Digital Service circuit from AT&T. Of course, the fact that satellites are being used benefits the 56 Plus service user. Customer premise earth stations can be estabished practically anywhere — DDS is not available everywhere. Unlike SBS, though, RCA uses C-band 6/4 GHz frequencies so it cannot broadcast directly into cities.

According to J. Robert Preston, manager of the service, the break-even distance when compared with DDS is about 1,500 miles. However, Preston pointed out that a coast-to-coast DDS line would cost about $11,000 per month and an RCA 56 Plus circuit around $9,000. The real savings are realized when more than one circuit is implemented: An additional DDS line will cost another $11,000; a 56K bit/sec circuit from RCA, only $2,000 more.

Present customers include the Insurance Company of America (ICA), which uses nine 56K bit/sec circuits; Penzoil; and Shared Medical.

Tomorrow's Hopefuls

When in December 1980 the FCC approved new satellites, launch dates and positions for the carriers discussed so far, they also opened the barn door and let three new carriers enter the domestic satellite stable. Of the 25 satellites approved for construction, six of the 20 OK'd for launch will come from the new brood: GTE, Hughes Communications and Southern Pacific Communications Corp. (SPCC). Each was given the green light to build three and launch two.

Hughes Communications, a unit of Hughes Aircraft Co., heralds from a corporate family familiar with satellite design and construction. Hughes Aircraft built the birds of Western Union and SBS, to name a few, and is presently constructing the AT&T Telstar-3 satellites.

With the expertise in its back pocket, it was only natural that an arm of that company eventually would plan to operate its own satellite system.

"Galaxy," Hughes' proposed satellite system, initially will consist of Galaxy 1 and II scheduled for launch in 1983, with the third acting as a ground spare pending demand and FCC authorization.

Hughes is approaching the satellite communications market with a common ser-

RCA lost contact with Satcom III a few days after launch. It was never heard from again.

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'Transponder demand will probably exceed supply until mid-decade, when all the birds now planned are aloft.'

intent. The apple of its eye is the CATV market. Common enough. But instead of proposing the iease of transponders to these programmers, Hughes Communications is offering up its capacity for sale — sort of a satellite condominium.

Transponders are not cheap; they cost somewhere in the $10 million to $20 million range. Nonetheless, 14 of the Galaxy I transponders have already been accounted for: Times Mirror Satellite Programming has ordered two; the Group W Sateiiite Communications Division of Westinghouse Broadcasting Company, Inc. wants four; Turner Broadcasting, two; and Time, Inc. is in for six. Jacque L. Johnson, director of marketing for Hughes Communications, said the company is close to selling four more.

Galaxy II, which will be a sateilite of the same design and type, will be used eventually for business communications services, Hughes has said. Traffic will be the usual voice and data and, where needed, video.

GTE Satellite, a GTE subsidiary, is planning to launch the first of its K-band satellites in 1984. The two Gstar satellites will share that 14/12 GHz K-band frequency range with SBS' satellites and eventually with the hybrid birds of Western Union and Southern Pacific Communications Corp.

It would at first seem likely that GTE would use Gsat's facilities, once in place, to supplant the need of ieasing capacity from AT&T. But, according to Arthur McNaulty of Gsat, that will not happen. Gsat will offer private satellite communications services to the business sector, with initial plans calling for the support of more data than voice or video.

The K-band Gstar satellites each have 16 54-MHz bandwidth transponders. It will be a digital system, like SBS, and support data transmissions of 90M bit/sec. The use of K-band frequencies will also allow Gsat to broadcast directly to the rooftops of organizations, even in microwave-laced airspace.

Southern Pacific Communications's Spacenet Division is the only other company that has proposed the launch of hybrid C-K-band satellites like those of Hughes. As with SBS and Gsat, the K-band frequencies will enable the broadcast of signals directly to office buildings.

But there is another potential impetus for SPCC to use K-band frequencies. Simply, one of the primary uses of the Spacenet-1 will be to trunk traffic for Sprint, SPCC's microwave Bell-alternative. Those K-band frequencies could enable SPCC to locate central long-haul trunking nodes in microwave congested areas. The C-band transponders may be used where congestion is less of a problem but weather is more severe.

Transponder Layout

SPCC awarded a $100 million contract to RCA Astro-Electronics in December 1981 for the construction of its proposed three-satellite system. Each Spacenet craft will have 24 transponders, 12 of which will be 36-MHz C-band transponders, six other C-band transponders will have a bandwidth of 72 MHz and the remaining six K-band transponders will also have a 72-MHz bandwidth.

Additional transponders in the two-satellite system will be leased to people with ground equipment to do with what they wish. SPCC will be concerned only with keeping the satellite positioned.

A Look at Demand

In this land of plenty, it is often hard to realize that some resources are finite.

The oil "crisis" of 1973 brought this fact home to America in a very tangible way. Currently, the growing squabble over water rights in the Sunbelt stems from the same phenomenom.

Now there is a shortage of orbital satellite slots. — at least the market is acting as though there is. The domestic satellite skies have been open to competition for a decade, but heated bidding before the FCC for assignment of slots did not get under way until this year — after RCA iost a satellite and the resultant demand heat-up for transponders for CATV convinced others that maybe, after all, there was some money to be made in satellite carriage.

The current bidding for transponders means that transponder demand will probably exceed supply until mid-decade, when all the birds now planned are aloft.

The shortage is such, in fact, that, even if there will not ultimately be enough end-user demand for CATV programming, teleconferencing or digital (Xten-like) transmission systems for all of the suppliers that hope to be in place by mid-decade, it will not affect today's demand for transponders.

"Even if there won't be that much traffic," said Dr. Jerome Lucas, president of Telestrategies, Inc. and former scientist with Comsat, "companies have to line up their space segment [transponders] now. They have to have that first and foremost — only then can they put together a system. And in the overall scheme of things, compared to programming costs for example, it doesn't cost that much to get that transponder and keep it in your hip pocket."

Question of Efficiency

But, since demand is more a question of economics than anything else, the real question becomes "how efficient does the space segment have to be?" Compared with terrestrial line charges, construction of microwave facilities, or long-distance stringing of coaxial cable for TV, transponder rental (or ownership if you buy into Hughes' satellite) may not be that expensive. At ieast one bank, for instance, is ieasing two transponders for its private network — yet its current traffic could hardly dent even one transponder.

And the microwave competitors for AT&T's Long Lines, like MCI Communications Corp. and SPCC, will almost be forced to go with satellites as residential customers hop onto their networks. (And they will: American Express is now marketing MCI to its card holders.)

As long as technology continues to outpace the Bell System's ability to replace its plant — built over the last 100 years — the alternative transmission schemes will continue to be attractive.

And domestic satellite communications will indeed achieve stardom in the 1980s — some fortunes will be made, some venture capitalists and stockholders will get burned and not all the entrants will make it. But in the end, consumers and business will be the benefactors of the visions of Isaac Newton, Arthur C. Clarke and John F. Kennedy — and ali those workaholics who turned vision into reality.

John Dix is managing editor for the Distributed Processing Reporting Service at International Data Corp. ‡ ◆

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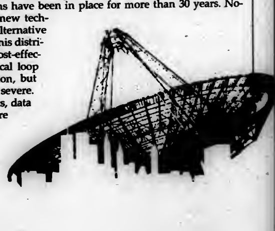
By Jerome G. Lucas

DTS

DIGITAL TERMINATION SYSTEMS

The era of digital termination systems is here. The driving forces of telecommunications have just created their latest business and application opportunity superstar. Digital termination systems (DTS) are the set of technology and service options including microwave, cable TV, unloaded telephone company wire pair, infrared and digital radio broadcast approaches available for wideband local distribution. DTS is a solution to the telephone company local-loop bottleneck or "last mile" between a business user application and a spectrum of high-speed, long-haul digital transmission facilities as provided by a growing number of satellite network vendors. Industry attention is focused on DTS today because the necessary telecommunications driving forces — technology, politics and money — are now working in unison on this opportunity. This has not been the case in the past. First, DTS is being propelled more by vendor push than by user pull. Only the promise of "the office of the future" exists. Quite clearly, the high-speed business devices have not yet arrived in quantity. On the vendor side, technology for new products and services as usual moves relentlessly. DTS is no exception. The two leading technology options are not newcomers. Digital microwave radio has been under development and implementation for more than 20 years and cable TV systems have been in place for more than 30 years. Nowhere in our networks are these new technologies needed more than as an alternative to telephone company wire pair. This distribution facility was designed for cost-effective voice service. This type of local loop can be used for digital transmission, but the performance limitations are severe. Using the same voice grade circuits, data rates of up to 9,600 bit/sec are achievable today with a modem. Higher bit-rate modems with enhanced modulation schemes are available, but have not proven to be cost-effective. In



addition to limited capacity, the performance regarding bit error rates is not adequate for many data applications. New DTS alternatives can provide 10^{-8} to 10^{-11} bit error rates compared with 10^{-4} to 10^{-5} bit error rates for wire pair with modems.

Other Options

Two other wire pair options provide digital transmission at rates of up to 56K bit/sec. These are AT&T's Digital Data Service (DDS) and Service 100 with W3 facilities. DDS is available in major metropolitan areas at data speeds ranging from 2,400 to 56K bit/sec and, in special cases, up to 1.544M bit/sec. AT&T supplies a terminal device to the customer called a Data Service Unit capable of retiming and generating bipolar signals over a pair of half-duplex, nonloaded wire loops terminating at a telephone company central office.

The other facility, W3, is basically a nonloaded, local-loop service within a switching system area. In this case, coverage in urban areas would be limited to distances of up to two to four miles. This circuit requires a special kind of modem with automatic equalization to account for the unremoved bridge taps present in most local loop distribution facilities.

Note that the ubiquitous telephone circuit coming out of the wall is not two wires originating at a switching center and terminating at your telephone, but rather a conducting path configured from a number of multipair feeder and distribution cables with cross-point-type connections at cable intersections.

The unnecessary wire tails or spurs are called bridge tapes and are analogous to tuned organ pipes that can resonate at a frequency related to their length.

In many cities, both DDS and W3 are difficult to obtain from AT&T, particularly for the specialized common carriers. DDS is frequently found in large data user networks, but the service is relatively expensive and implementation delays of up to one year are commonplace. W3 is not a widely used facility even for end-user applications.

Increased Cost

A far more pressing problem for the competing carriers is the increasing cost to telephone company local distribution. Today, specialized common carriers are paying 25% of their revenues to the telephone carriers for local access lines. That figure may soar to 50% within three to five years based on current trends.

Remember, when the Federal Communications Commission (FCC) established the category of specialized carrier more than 10 years ago, it never intended for those new entrants to compete for public switched voice services. It would be naive for the approximately 26 competitors of telephone company switched voice services to think the FCC is going to come to their rescue when local-loop access charges begin to soar..

DTS services will be developed if only to provide an alternative to AT&T services and plant facilities and to provide some protection to tariff increases. An end-to-end network service or product completely independent of AT&T is a much stronger investment candidate than one that depends on a competitor for the "last mile."

Finally, politics is the third driving force needed to make DTS alternatives a reality. The FCC took a monumental step when, on April 17, 1981, they issued the written text of the ruling opening up the 10.55 GHz to 10.68 GHz band to DTS-type microwave radio. The competition for this 130 MHz of microwave radio bandwidth to date is a good indication of industry interest.

DTS/Microwave Radio

The FCC defines two types of carriers that can apply in DTS/microwave radio authorization: extended network carriers, which can operate in 30 or more cities, and limited network carriers, which operate in one to 29 cities.

Initially, extended carriers were assigned 40 out of the 130 MHz total. Authorized carriers in this category would be assigned 5 MHz each. The limited carriers were assigned 30 MHz with 2.5 MHz per carrier. A spectrum allocation for internodal links of 30 MHz and reserved spectrum of 30 MHz was made as well.

Assuming the extended carriers were awarded the reserve band, there would be room for seven extended carriers and six limited carriers with 5 MHz and 2.5 MHz of bandwidth, respectively, for full-duplex services.

The most important feature of this microwave radio ruling making it unique is that a frequency band or channel is assigned to a carrier once and for all in each city authorized. The carrier can manage the use of this spectrum and install customer premise radios without further FCC coordination.

This new microwave distribution concept consists of a central radio control station transmitting digital traffic continuously toward its associated remote user sites. The data, which has been time division multiplexed (TDM) into a continuous stream, carries addresses to specific remote sites. Each remote site monitors this signal and processes only the data addressed for that given location.

In turn, a remote site responds to or addresses the central station by transmitting bursts of preassembled packets of data for a predetermined or controlled time interval on another allocated frequency. This frequency is shared with several other remote user sites being served by the central node.

Thus, a cluster of remote stations time-share a given frequency. This technique, known as time division multiple access (TDMA) offers many technical advantages. As other users

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enter the network, they are assigned time intervals for their traffic. For increased capacity, new frequency pairs may be established between remotes and the central node.

Typically, a central site can cover an area with a nominal radius of six miles. For extended geographic coverage, several distributed central node sites can be used because, with frequency and polarization separation, interference beyond six miles is negligible and the spectrum can be reused.

Also, at any of these sites, an interface via a satellite network to other cities cen be established.

The microwave radio transmission link can operate up to 1.544M bit/sec. Within these rates, capacity may be dynamically reallocated to accommodate occasional peak demands from various users.

The central station can include the processing capability to monitor user needs and reassign capacity among its remote stations based on regional services.

The user equipment will typically include a two-foot-diameter dish antenna that can be mounted within a building or outdoors. Also on the user site would be a digital controller to interface with user data terminals. This controller could be a statistical multiplexer or a data PBX.

DTS/Microwave Radio Applicants

As of year-end 1981, 12 DTS/microwave radio applications for extended carrier status and two applications for limited carrier status were filed with the FCC. Six applicants were established carriers with a large customer base: Tymnet, Inc.; Satellite Business Systems; GTE/Telenet; Western Union; RCA; and MCI Communications Corp.

Of these, Tymnet has the early lead. It is the holder of an experimental DTS-microwave radio at 10 GHz in San Francisco filed for as part of the joint demonstration program with SBS and Local Distribution Co. (a M/A-COM, Inc. and Aetna Life and Casualty partnership).

The other eight applications are either smaller carriers or newcomers to the data services marketplace. They are: Insurance Commissions of America Communications (Isacomm), Graphic Scanning, Digital Termination Service, National Microwave Interconnect Corp., Data Services, Inc., Via/Net Co., Local Area Telecommunications and Contemporary Communications Corp. Of these, Isacomm is already moving quickly to establish a 50-city DTS network for enhanced common carrier services to end users. They have in place a 10-station satellite network leased from SBS as well.

The FCC will have to deal with this contention situation. There are more extended carrier applications than there are frequencies in the extended plus reserve allocation available under the April 1981 ruling.

Among other options, the FCC can:

- Take spectrum from the limited carrier allocation, since only two applications had been received by the end of December 1981.
- Allocate more spectrum.
- Undergo competitive hearings.
- Shift the "newcomers" into the limited allocations until they establish their proposed services.

This issue should be resolved early this year.

The market for DTS-microwave radio equipment alone is substantial. More than $700 million will be required collectively by the 14 present applicants in order to implement a start-up operation in the cities specified.

The competition regarding equipment supply should reduce to a battle of the giants — M/A-COM and Nippon Electric Co. Both corporations have a strong technology base in digital microwave and processing control. M/A-COM has the lead and already has off-the-shelf equipment plus two years of system field experience at 10 GHz. Because of this, most of the extended carriers used the M/A-COM approach to their filings.

The Nippon approach uses a more powerful modulation scheme, QPSK on the radio frequency channel. As a result, the capacity per bandwidth allocated will be greater. Also, Nippon has a larger base for digital microwave products because of its international market position. This is partly the reason it is quoting lower costs: $120,000 for a central node vs. $340,000 quoted by LDD Co., the common carrier distribution arm of M/A-COM equipment. Both LDD and Nippon quote $11,000 for a subscriber unit (antenna, radio frequency equipment and digital controller).

M/A-COM has proposed using four-level PSK as its radio frequency modulation technique. Whereas this approach is not so effective regarding capacity as QPSK, the digital controller and processor introduced in operational systems will likely approach a minidata PBX in capabilities with demand assignment features for spectrum optimization.

DTS — Cable TV

DTS with 10 GHz digital microwave will probably be saturated with applications by the mid-1980s. An extended carrier using the 5 MHz allocation in a major metropolitan area has 5M- to 40M bit/sec of capacity available. This assumes frequency reuse, dual polarized carriers and four-level PSK modulation — enough capacity to start an enhanced data service business, but not to grow it.

At this point, DTS over cable TV should come of age. When the local broadband demand for business service is demonstrated and desirable digital microwave frequency bands become saturated, the cable industry will take notice.

The capacity of a cable system for DTS service is phenomenal relative to the available microwave spectrum. A dual 300 MHz cable line could handle 130,000 low- and medium-speed terminals with capacity

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'With DTS, the user can go one step further and implement privately owned systems.'

remaining for five analog video channels. Alternatively, a Scientific-Atlanta Series 6400 modem could accommodate 132 Texas Instruments, Inc. systems capable of supporting 3,168 digitized voice or 56K bit/sec data channels.

Manhattan Cable Television is one of the few systems providing DTS services. Data transmission service is provided to the business community of New York by a dedicated cable that runs along Broadway from Columbus Circle south to Battery Park.

Manhattan Cable provides data transmission service to 1.544M bit/sec at prices or rates lower than DDS. Presently, there are about 130 active data links yielding an annual revenue of about $1 million.

Recently, a direct link to SBS' earth station at 1 State St. in Lower Manhattan was established.

This will likely result in even further use of the cable system for DTS service.

End-User Applications

The end-user applications for DTS are many. Given the range of data speeds up to 1.544M bit/sec, the application potential for high-speed facsimile, video conferencing, digitized voice trunking and high-speed computer-to-computer linkage should be extensive and cost-competitive with existing telephone company services. Given the cost of an installed subscriber unit, $4,000 for cable TV or $13,000 for a DM transceiver, the rates paid by the user should be in the $300- to $1,000/mo range.

This should be a bargain, considering alternatives such as a dedicated rooftop satellite earth station. For example, a dedicated SBS earth station providing 1.544M bit/sec service would lease for roughly $15,000/mo. It can take more than a year to implement a rooftop earth station. A window-shot radio transceiver can be up and running in four hours.

In addition, the earth station installation fee can be as high as $300,000 for an urban rooftop location, not to mention the 1,000 square feet of interior floor space needed to house the satellite communications controller. A two-foot microwave antenna with DTS microwave transceiver equipment is a lot easier to install than a 4,000-pound "SBS-type" earth station.

Granted the dedicated earth station has more capabilities. However, with the growing number of multiple user earth stations, such a dedicated satellite access point is not always needed, nor will it be cost-effective in many instances.

In addition to the utility of DTS to the end user and specialized common carrier, local computer network and private branch exchange (PBX) equipment vendors should find value as well. Office equipment vendors such as Datapoint Corp. and Wang Laboratories, Inc. already are introducing interbuilding transmission hardware as an integral part of their product line. Datapoint has developed a system capable of full-duplex, 2.5M bit/sec computer linkage quality transmission up to one mile. Wang has introduced a cable TV compatible broadband network called Wangnet to support its computer and word processing product line.

Private Systems

With DTS, the user can go one step further and implement privately owned systems. The FCC is preparing a notice of proposed rulemaking to allocate a send frequency band, 17.7 GHz to 19.7 GHz, for DTS. The commission intends to assign a spectrum for private or end-user owned systems.

At 18 GHz, central node coverage in heavy rain areas will be cut in half — three-mile vs. six-mile radial coverage as with 10 GHz. However, range coverage could be improved with a larger transceiver dish or higher power radio frequency transmitter.

Business cable TV users are beginning to lease channels and even entire trunks from operators. Bankers Trust Co., for example, has such an arrangement with Manhattan Cable in New York.

Two high-speed channels at 230.4K bit/sec are on the cable between 1 Bankers Trust Plaza and 1775 Broadway.

AT&T and DTS

While its competitors and customers are scrambling to implement DTS services this year, AT&T plans to begin offering switched digital capability in 1984. Bell loops will support up to 56K bit/sec over converted analog local loops. These circuits will terminate in a No. 1 A ESS voice switching office.

To set up a call, the user, via a Touch-Tone telephone, enters a special code along with the number of the called party. Associated customer premise, network channel terminating equipment would then be enacted much like a dedicated line modem.

A second capability designed to connect interactive home and business information services such as videotex, telemetry services, burglar alarms and so on is also in the planning stage. Transmission rates of up to 8,000 bit/sec could be supported simultaneously with voice communications over a single line. The data stream would occupy a frequency band above the voice spectrum assignment.

The far-reaching impact of this proposed service should not be underestimated. In concept, however, this system has been referenced by AT&T as far back as the mid-1960s. Applications at 56K bit/sec — such as switched high-facsimile, encrypted voice, slow-scan video conferencing and data services not requiring a low bit error rate — should be served well, however.

The two greatest service limitations from the user's perspective will probably be the difficulty AT&T will have in modifying voice-grade local-loop plant in a timely fashion to support the higher speed data applications and the bundled nature of service.

AT&T's competitors and privately owned systems will not necessarily be tied to a switching facility. Dedicated or full-time transmission will be supported. Coupling or bundling the local transmission plant with a voice-grade switch will not serve some applications as well as unbundled DTS.

Outlook

The new markets DTS provides carriers and equipment suppliers will be substantial. Carrier annual revenues are estimated to exceed $1 billion by 1990. Cable TV facilities with enhanced two-way services will pass over 50% of major business user computer and information processing centers in the top 50 Standard Metropolitan Statistical Areas by 1990 as well.

Other user-owned systems utilizing high-frequency microwave at 18 GHz and 24 GHz, infrared and FM radio subsidiary channels will provide equipment manufacturers with $300 million in annual sales by 1990.

Users should look forward to a spectrum of new high-speed services starting at the end of 1982. Also, the value-added carriers will be broadening their service scope to include on-site data PBX services tied into DTS. This package will likely be offered for outright sale to users with extensive data communications requirements.

Finally, DTS will prove to be a timely and vital link between the new office products such as intrabuilding computer networks and integrated voice-data PBXs and the proliferating long-haul network services. It appears the concept of the total end-to-end digital network has finally arrived.

Jerome G. Lucas is president of Telestrategies, Inc., of McLean, Va.

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DATA COMMAND SYSTEMS

By Richard A. Foster

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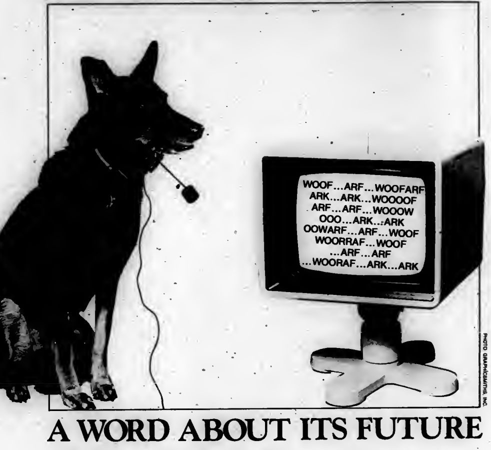

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A WORD ABOUT ITS FUTURE

Most computer terminals in the next two years will offer, in addition to the keyboard, voice recognition for data entry, at least as an option. Significant evidence of this trend can already be seen in the industry.

Voice recognition is currently bringing greater productivity and accuracy to many companies for a broad range of applications. The technology has come out of the laboratory into real-life applications. Major terminal manufacturers, including Interstate Electronics Corp. and Lear Siegler, Inc., are now marketing voice recognition capabilities for video display terminals. Others are actively working to add voice recognition to their product lines. What this signals is that speech recognition as a key solution to the data entry bottleneck is no longer considered an experimental technology, but rather a maturing one. Today, the basic question potential users ask is not "Does it work?" but "How can we use it?"

As with many new developments, the availability of lower cost voice recognition products to suit a wide spectrum of applications has contributed to this broader acceptance.

Terminals equipped with voice recognition capabilities now sell for less than $3,000, down from more than $20,000 just two years ago. High-performance voice recognition chip sets, suitable for data entry, are available to computer and terminal manufacturers for as little as $100 in large quantities. Lower performance chip-level products now cost as little as $10.

From a technology standpoint, most systems available today are speaker-dependent: each operator must train the system to recognize his or her voice patterns. These products can recognize as many as several hundred words at accuracies of 98% to 99%. Most of these systems are also what are called discrete word recognizers: the operator must pause very slightly between words or short phrases. But the applications for this level of the technology are nearly limitless.

How does a company know when it should be looking at voice recognition capabilities?

'GE estimates 33% fewer inspectors will be required in manufacturing because quality data entry will be a real-time, on-line operation.'

The best way to show the potential of a technological development is to cite some good examples of how it is already in use. And, the best place to begin is by talking about the bottom line.

At General Electric Co.'s range manufacturing plant in Columbia, Md., the company has initiated a pilot program for quality control. Inspectors wear lightweight microphones and transmitters into which they enter observed defects on parts moving along a conveyor. The verbal comments from the inspectors are immediately entered into a data base, where the inspection is available to manufacturing control so remedial action can be taken if necessary.

GE also plans to use voice data entry for inventory control, production line monitoring, factory data collection and area access control. Company officials expect the present system to pay for itself in much less than a year. Further, GE projects savings of more than $100 million during the next five years when the technology is applied to data entry throughout the company. That is advantage No. 1 — voice data entry significantly reduces data entry cost.

Productivity Estimate

What about productivity? GE estimates that 33% fewer inspectors will be required in manufacturing because quality data entry will be a real-time, on-line operation. "Voice has the potential for being the most accurate and reliable way of getting factory data into the computer and will provide GE with an important productivity advantage," the program manager for voice applications has said.

Voice data entry results in a much more efficient use of personnel because it requires less data entry time, less operator movement from the terminal to the assembly line and back and less operator training time. Operators who are not familiar with a keyboard are able to use their most natural means of communication — speech.

Other examples clearly show the broad range of applications for which voice recognition is already in use.

Chase Manhattan Bank, for example, permits its credit union customers in various states to conduct electronic funds transfer transactions by voice direct to a computer in New York. Because the speaker's voice print is required for security and audit trail, voice recognition provides important additional benefits to the bank by greatly decreasing the possibility of fraudulent transactions.

Calma Co., a manufacturer of computer-aided design systems, uses voice commands to allow the design engineer to focus on the total design image while calling up commonly used elements from his "menu" by voice.

By eliminating the frequent diversion of hands and eyes to the keyboard or light-pen menu board, Calma estimates, productivity of the highly paid designer will double, while more efficient use is made of some very expensive capital equipment.

Other examples of voice recognition for data entry include office automation, word processing, inventory control, shipping/receiving and maintenance/repair recordkeeping.

Other application areas are sales order entry, airline reservations and telephone bill payment.

How does a firm know when it should be looking at implementing voice recognition equipment? By analyzing operations and by asking the following questions:

- Is the reporting system computerized?
- Are data entry steps repetitive?
- Does the system use a limited number of identifiable operators?
- Can a predefined vocabulary be used to enter data?
- Is the firm most anxious to save costs?
- Most important, would the firm like to enter data at the source?

Next, determine if operators must do one or more of these:

- Use hands, eyes, or both in other transactions.
- Move from place to place.
- Access the computer by phone.

If several of these factors apply, then it is time to start inquiring about voice data entry equipment.

The speech recognition market is projected to exceed $100 million by 1984, up from $10 million in 1980. Market research firms are predicting the market will top $1 billion by 1990 and growth similar to that of microcomputers is predicted.

Voice recognition will ultimately become the most commonly accepted method of data entry — communications between man and machine — just as speech is the most common and natural form of communication between people.

Richard A. Foster is president of Interstate Electronics Corp., which is headquartered in Anaheim, Calif.

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By William F. Zachmann

PLANNING AND DESIGNING A COMMUNICATIONS SYSTEM:

PHOTO: GARROW THROOP

A PRACTICAL GUIDE

In most large organizations, computer systems and communications systems originally were handled in separate areas. Prior to the development of teleprocessing applications in the late 1960s, all telecommunications were either voice or Telex and were handled by an individual or a small department whose primary responsibility was dealing with the local telephone company. The DP department dealt with one or more computers, typically in a central location and operating on a batch basis.

The advent of teleprocessing applications brought these two separate functions together for the development of new applications requiring data communications with a site removed from the central computer. Arrangements for leased dedicated lines (perhaps with special conditioning) usually were made through the department currently handling the voice line services from the telephone company.

'The Drafis model involves a concept of resource stations linked via a communications backbone.'

This division of function remains quite common today, although a trend toward bringing the telecommunications department under the umbrella of the information systems division is undoubtedly under way. This trend makes sense for two reasons:

- Even in the area of present voice communications, evaluation of alternative systems and the use of new private branch exchange (PBX) systems must rely more and more on expertise in computer technology.
- The historical separation of the computer and communication requirements makes less and less sense in the contemporary technological environment.

Because the overall business plan of an organization is usually expressed in financial terms — pro forma profit-and-loss statements and balance sheets — there is a tendency to define all planning in these terms. This is not without justification, but if matters are left there, many critical issues will be left aside.

International Data Corp.'s (IDC) recent research into data center planning and user success with teleprocessing suggests that an integrated planning process with somewhat different components for different time periods may be desirable. The long-term distributed resources systems plan (including computer and communication components) is best related to an information model of the organization.

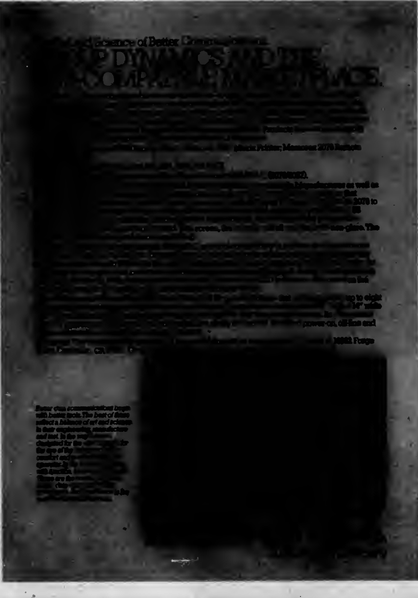
General Model

Traditional ways of looking at data communications generally focus either on the computer system (viewing communications as an appendage) or on the network itself (viewing the equipment on the ends — computer and terminals — as appendages). Neither approach defines the entire system adequately. What is needed is a highly general, integrated model that allows for flexible application to superficially different technologies and architecture.

We have developed a model that has proven quite useful in our internal analysis of alternative technologies. Although reluctant to add to the already large collection of industry acronyms, we felt a concise identification for the model was needed.

The Distributed Resources Architecture for Information Systems (Drafis) model provides a way of looking at communications in the context of the larger system. Drafis has some significant similarities to the early 1960s' general systems models, which have been largely forgotten as the computer and communications industries have become absorbed in the day-to-day problems of implementing usable systems. However, Drafis differs from earlier models because it provides a more pragmatic framework than the highly general systems models did.

The Drafis model involves a concept of resource stations linked via a communications backbone. These two are structured to make an integrated system. Because any system necessarily has boundaries, the Drafis model also has a third element — external interfaces.



Resource Stations

Resource stations correspond roughly to what have been called terminal nodes in a network, but with some important differences.

They have three basic capabilities: processing, storage and communications.

Processing refers to the information processing intelligence at the station. This implies some sort of programmed or programmable hardware. The model is deliberately very general and can refer to anything from a large and sophisticated computer to the most elementary unit of circuitry.

Storage implies some form of local storage available at the resource station, whether read-only memory (ROM), random-access memory (RAM), disk or tape storage or simple circuit memory. The model requires only that some form of local storage be associated with the resource station.

In the context of resource stations, communications means a resource station has some capability for communicating with other resource stations — sending and receiving information of some sort. Again, this is defined very generally; it can range from an elementary on/off signal on a lead wire to very elaborate communications capabilities.

Communications Backbone

The communications capability associated with an individual resource station, in turn, defines its interface to the second major part of the Drafis model: the communications backbone.

The communications backbone is defined in terms of whatever connects the various resource stations with one another in whatever configuration. This corresponds roughly to the notion of a communications

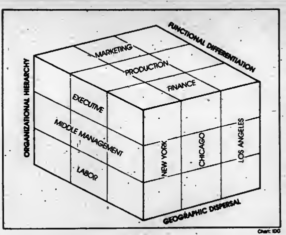


Chart: IDC

Figure 1

network, but is a much more general definition. The communications backbone also has three main components: medium, coding and routing.

The medium refers to whatever provides the physical basis for the transmission and reception of information between resource stations. In any given system, the medium may be singular or multiple. The physical component may be twisted copper-wire pairs, coaxial cable, fiber-optic cable, airwave transmission (microwave or other broadcast transmission), waveguide and so on. These are fundamentally interchangeable from the general standpoint of the Drafis model.

Coding refers to the method by which information is represented for transmission across the medium from one station to another. It includes the type of code used to represent information (Ascii, Ebcdic, analog, Baudot, Morse and so on) as well as the means of physical representation (amplitude or frequency modulation, voltage, phase or frequency shift and the like).

Routing is the means by which transmitted information is directed from one resource station to another or to several other stations. Actual methods for routing may vary within wide ranges and, depending upon the specific application of the model, may shift between the communications facilities of the resource stations and the communications backbone in varying degrees.

External Interfaces

Because the linkage of the resource stations via the communications backbone defines a bounded system, external interfaces to the system must also be included in the model. These also are divided into three main types: people, machines and world.

Interfaces with people include anything that falls, in the broadest sense, into the concept of man/machine interface — everything from simple teleprinter input and output through interactive moving color graphics terminals to voice recognition and output. The category also includes printed output, keypunch input and any other means by which information goes into the system from people or goes out to people.

The interface with other (information) machines includes any machine-readable interface to other systems. This can be as prosaic as tapes or disks transported by taxi or truck to other systems. But it also includes real-time interface with other systems via what has been referred to in network terminology as a network window or gateway. It includes all the places on the boundary of the system where an interface to another distributed resources system (DRS) takes place. A link between a local area network and Arpanet or Telenet or to a distant computer center would be examples.

Interfaces with the world include all interfaces of the distributed resources system in which the input to the system is sensor-derived and the output is action. On input, this involves such things as sensing light levels, temperature levels, position and speed — any instance in which the input is not originally coded as data, but is interpreted as information about the state of the world or some part of it. Some form of analog-to-digital conversion is generally implied, since we are talking about digital distributed resources information systems.

On output, the world interface involves action. The output information is translated into a change in the state of the world, for example, computer-aided manufacturing, where the output of a system may be a change in position of a machine tool. Other examples include turning a furnace or air conditioner on or off, opening or closing a door or window, moving a vehicle, aiming a cannon and so forth.

The Drafis model — and the implied conception of distributed resources systems — has two very important properties that distinguish it from traditional ways of describing communications networks.

First, it may be applied to empirical systems at more than one level. As such, it permits descriptions of systems in terms of a hierarchy of levels.

Second, far from being merely an alternative description of communications networks, Drafis can be used to describe any computer/communications system whatsoever. Some examples may help to bring the rather abstract description of the Drafis model down to earth.

Many microcomputer and minicomputer systems are assembled, internally, around a bus architecture (for example, Intel Corp.'s Multibus). In this approach, the main processor, memory processor(s) and I/O handlers are linked by a communications bus (see Figure 2). The Drafis model can be applied to this internal architecture within the main processing unit. The various component processors can be viewed as resource stations, the bus as the communications backbone and the connections to the I/O devices themselves as the external interfaces.

Shifting up one level, the central processing unit component of a computer system (which includes the entire system described in the last paragraph) can be viewed as one resource station in a larger system. In this case, the tape, disk, printer and communications control units are also defined as resource stations, and the cable that connects them and the internal signalling constitutes the communications backbone. Defined at this level, the I/O devices and terminals are the external interfaces to the system.

Still another level up, various computer systems and communications processors can be treated as resource

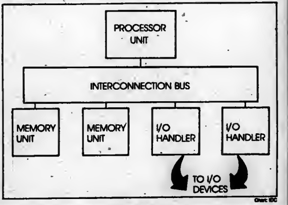


Chart: IDC

Figure 2

'Drafis can be used to describe any computer/communications system whatsoever.'

Distributed Resources
Architecture
For Information Systems
(Drafis Model)

Resource Stations
- Processing
- Storage
- Communications

Communications Backbone
- Medium
- Coding
- Routing

External Interfaces
- People
- Machines
- World

Chart: IDC

Figure 3. Hierarchy of Levels

stations in a DRS linked by a communications backbone of telephone lines, microwave or satellites and so forth. Interfaces to the system as a whole become the various input and output stations.

In being applicable at all these levels, the flexibility of the Drafis model helps to point out that the underlying structure of the whole range of DRS is the same, whether we are talking about the internal structure of a mini/micro system or about worldwide communications networks. *All have the same basic elements.*

These are described by the Drafis model in its major components: resource stations, communications backbone and interfaces. The key elements of the Drafis model are summarized in Figure 3. IDC has only begun to identify possible applications for the model, but they go well beyond communications networks as they have been described up until now. Multicomputer architectures such as those seen in the growing number of distributed mini/microcomputer systems can also be described using the model.

Organizational Context

The distributed resources system, which includes a given communications network, must be understood in the context of the organization it serves. The relationship between the structure of an organization and the structure of the corresponding DRS should be examined.

The configuration of a distributed resource system can be described in various ways. Functionally, however, it must reflect the relevant information flows of the organization and the applications it serves, both internally and externally.

Many factors will affect the organizational requirements for distributed resources systems. The weighting of individual factors and their precise application will vary from one situation to another. Key factors include geographic pattern of the organization, the shape of the organizational chart, the degree of centralization/decentralization and the functions to be performed. Each must be taken into account in terms of both internal and external information flows.

Consider two cases. The first is a highly centralized organization with a strict hierarchical organization and little downward delegation of budget and decision authority. It is located in a single building with a relatively homogeneous set of functions to perform. The second is a diverse, decentralized, geographically dispersed organization. It uses matrix management and substantial delegation of budgetary and decision-making responsibility. Obviously, the two cases differ substantially. In planning for communications networks to support DRS, a careful analysis of such factors is essential.

However, it is important to recognize that the configuration a DRS should have is not always correlated to these organizational characteristics in a simple, obvious manner. The highly centralized organization, for example, may require a highly centralized architecture for most internal systems, but it may interact externally with other organizations in a very decentralized manner. A money center bank with no significant branch operation is such an example. The internal system will be quite strictly hierarchical, but its external communications may involve a highly decentralized bank network.

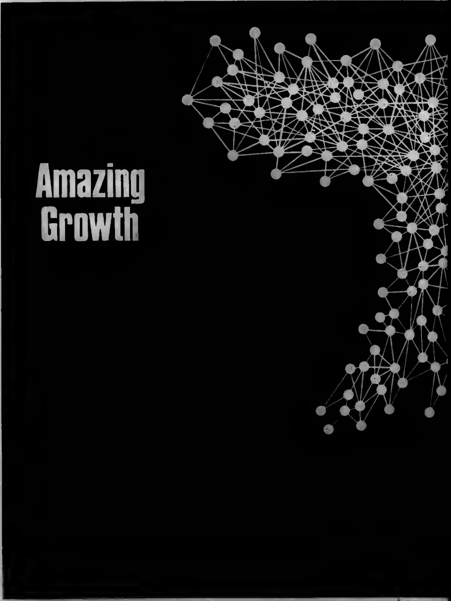
It should be noted, too, that the concept of a distributed resources system in the Drafis model does not necessarily imply a high degree of decentralization in the system. It does not, in other words, apply only to what have been called distributed data processing (DDP) applications. The individual resource stations may have widely varying capacities and may be hierarchically configured. In the Drafis model terminology, even the so-called "dumb terminal" may be treated as a resource station because it does meet the criteria of containing logic, storage and communications capability.

For the relatively near future, it is most unlikely that any distributed resources system will encompass all the information flows in an organization. Yet, in planning for DRS, it is very important to understand the total pattern of information flows in order to put a particular system in context and evaluate alternative systems and implementation sequences.

A heuristic device that can be used for this is a model of a three-dimensional information space in an organization (see Figure 1 on Page 43). The axes represent layers of organizational hierarchy, functional differentiation and geographic dispersal.

Information nodes may be defined within the three-dimensional space. Possible paths between them can be analyzed to determine current information flows, desired future information flows now unavailable and suitability for implementation of given flows in various distributed resource information systems.

The methodology cannot be covered here in detail. It involves an analysis of the information space of the organization as the ideal boundaries within which a theoretically complete DRS could be implemented. Positions within the space



are then treated as potential locations for resource stations and the requirements for their processing, storage and communications capabilities are defined. Communications backbone options for linking the resource stations are then analyzed. Thus, the information space of the organization is mapped onto a Drafis model for planning the implementation of distributed resources systems.

This approach to the analysis of internal information processing and flow requirements can also be applied to external flows. Or, as is generally more readily done, external flows can be analyzed in the context of interfaces between the Drafis model of the entire organization and the external world. This is possible because almost any internal linkage of resource stations via the communications backbone can be transformed into an external interface by changing the level of application and the positioning of the boundaries of the model.

Organizationwide Model

Development of an organizationwide information model and updating of the model as more is learned (perhaps on an annual basis) can provide an extremely valuable reference point against which to measure individual applications systems and other components. Such a model must define the information space of the organization; define the stations within that space at which information is originated, stored, processed and communicated; analyze the flow of information among stations; and consider additional potential stations and flows that can improve the overall functioning of the organization. Implementation of the interrelated distributed resources information systems of the organization can then be phased in on a prioritized basis, taking account of the costs and benefits of individual parts.

In this way, a coherent five- to 10-year plan can be developed, based upon the integrated information model of the organization. The implementation phasing, determined by the interaction of priorities and available technology, provides the basis for a more specific three- to five-year plan that can be much more detailed in terms of particular projects and probable technological options to be used.

This long-term plan then forms the basis for a one- to two-year plan, more precisely costed out and with details of particular milestones and activities for the near term. The short-term plan defines the specific agenda for resource allocation and budgeting on an annual basis.

Obviously, all of this must be closely coordinated with the overall planning of the organization. Future developments in the organization as a whole can result in major changes in the space and configuration of its information space and must be incorporated into the information systems plan.

None of this should be taken to imply that the general model is unmodified by a realistic appraisal of where the organization stands at any particular time. The present situation, defined by such things as computer and communications hardware and applications systems currently in place or under development, imposes very important constraints on planning.

Effects of Technology

Of equal importance is the tuning of the planning process to the rapidly changing environment — especially the technological environment. It is not just the recent developments in distributed data processing applications that have received so much media attention lately, but a much broader set of developments. As generally discussed, DDP usually implies some movement of processing capability out from the central computer room in a star or hierarchical configuration — commonly called a distributed network.

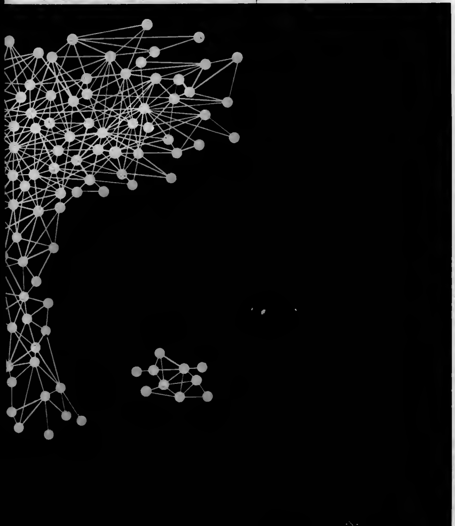
Increasingly, however, what we are seeing is a more fundamental shift from an hierarchical to a more fully distributed, fully connected peer configuration requirement. The rapid proliferation of piecemeal approaches to office automation, for example, will not be susceptible to an integrated solution until an adequate methodology for providing a compatible communications backbone for the individual resource stations is developed.

Once such a methodology is developed, the generalized connectivity that becomes available will, for the first time, make generalized access to corporate data bases, electronic mail capabilities and information handling and processing capability a realistic possibility. This will provide further stimulus to the development of new end-user-oriented, generalized software tools.

What we will see is an accelerating shift from particular applications toward generalized capability — both in linking various resource stations and in retrieving and manipulating data. A key to these developments will be highly modular systems for performing the processing and communications functions.

Necessity is the mother of invention in many cases, but it is simply not sufficient to anticipate only a one-way causality from requirements to technology. Technology and user requirements interact. New technology actually creates new requirements as its capabilities become understood and exploited. In communications networks, the speed of transmission of data and the flexibility of routing are especially critical parameters.

The amount of data that can be passed from one station to another and the flexibility and generality with which the data can be routed can make a very large difference. For example, the use of graphics display terminals requires that a large



'Usually, many compromises must be made between ideal and real.'

amount of data be sent in a short time. This implies that stations with graphics interfaces to people must have access to information sources via broadband, high-speed paths across the communications backbone. Similarly, maximum utility in electronic mail and messaging requires full connectivity access to other stations in the system.

Ultimately, the planning process must lead to specific hardware and software in place in the organization. No amount of theoretical consideration can avoid the necessity of bringing it all down to earth as wires and electronic boxes somewhere on a floor. Usually, many compromises must be made between ideal and real.

Hardware Options

Hardware components involved in distributed resources system network planning can be grouped into three main categories: terminating equipment, local distribution media and long-haul distribution media.

- *Terminating equipment: What equipment are we going to have?*

The major pieces of terminating equipment can be grouped into computers, communications controllers, terminal cluster controllers and terminals. Additional hardware includes such things as modems, multiplexers and concentrators. The distribution of functions across the hardware components can vary widely. With the widespread availability of minicomputer and microprocessor logic boards for all kinds of equipment, these approximate distinctions can be expected to blur further.

- *Local distribution media: How are we going to link it locally?*

Local distribution currently is most often implemented by direct cable connection, in a ring or hierarchical configuration, with a central computer or central computer area. It is handled on the model of the connection of peripheral devices to the central computer. Sometimes, static or dynamic switching to two or three computers at a central site may be effected either to provide backup or additional flexibility, either through a physical switch (static switching) or logical (dynamic) switching in an intelligent front-end communications controller or minicomputer.

Recently, various sources have begun to offer additional means of local distribution. Several bus architecture local distribution systems have been made available by various manufacturers.

Specialized wideband links have also become available for local distribution in recent years. This includes infrared light wave transmission, fiber-optic links, short-haul modems for cable transmission and local microwave. Each will have its appropriate uses.

- *Long-haul distribution media: How are we going to link to distant locations?*

Until very recently, long-haul distribution has been handled predominantiy via telephone company facilities. A recent IDC survey of teleprocessing users found 87.5% using leased lines and 50% using dial-up lines from the telephone company. Approximately 12.5% also made use of microwave transmission facilities.

Telephone lines or dedicated microwave still remain the dominant sources of long-haul data transmission. The increasing availability of satellite transmission channals, however, will certainly offer more users additional wideband long-haul alternatives and will play a bigger role in the future.

Shared Facilities

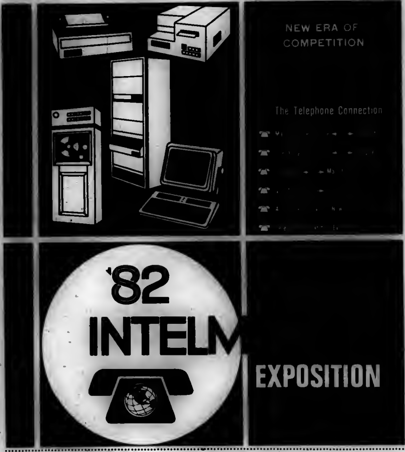
Users with very large long-haul transmission needs will have the option of buying or building their own satellite ground stations and lease spectrum space on satellite transponders. Various vendors also are offering shared facilities in one form or another in planned systems. Digital termination systems from various vendors will provide connection between user sites by means of cellular microwave radio transmission for metropolitan area distribution.

In addition, public packet nets such as Tymnet and Telenet are presently offering international data transmission facilities to end users for long-haul transmission. These are generally used as an alternative to the telephone company to provide dial-up connections for relatively low-speed data transmission: 300 and 1,200 bit/sec. In this kind of use, the packet net functions as the direct equivalent of the dial-up telephone line.

It is possible, however, to bypass the transparent interface and link directly via the X.25 interface to Telenet. This is not now a major factor in user employment of packet net services, but may become more important in the future.

Standards and Software

Too often, within a user organization, an executive with little techni



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cal knowledge of data communications can get the impression that disputes over which standards to follow or not to follow may be of immediate importance in planning for data communications for distributed resources systems. Popular periodical literature in the field can readily give the impression that, for example, choosing between the X.25 standard and IBM's Systems Network Architecture (SNA) is an important planning consideration.

Well, it is and it isn't . . . but mostly it isn't. The simple fact is that the majority of computer users obtain their major computer hardware from a single vendor. Each vendor offers its own communications capabilities: hardware and software. Most users will find that, unless they are prepared to change major hardware vendors, they will be best served for the near term by using the networking capability their vendor provides or one that is at least compatible with it.

For the vast majority of IBM-compatible users, the question will not be one of SNA vs. some other system, but whether and when to move onto SNA from earlier versions of IBM's communications capabilities. The X.25 protocol is no more a viable migration path for an IBM installation using Btam than the Control Data Corp. Scope or Honeywell, Inc. Gcos operating systems would be alternatives to a DOS/VS user migrating to MVS.

Different Purposes

Furthermore, the notion that X.25 vs. SNA is some sort of contest on equal ground makes about as much sense as asking whether a tractor or a station wagon is better. SNA is IBM's evolutionary networking system oriented primarily to hierarchical configurations around a central computer. It is one of the most sophisticated versions of the hierarchical (or distributed) configuration currently implemented and has both the strengths and weaknesses of that approach. It clearly offers significant functional capabilities over earlier IBM telecommunications facilities at, of course, the cost of additional memory, processing power and communications hardware.

The X.25 standard adopted by the Consultative Committee on International Telephone and Telegraph is an interface standard for the connection of data terminal elements to public packet nets. It was not really designed to be a general communications network architecture the way SNA was, anyway. In any case, SNA can quite readily interface to an X.25 packet net through an interface conversion process. It has alternative ways to link main processors (treating the problem as a linkage of SNA control domains), but can happily use a packet switch network as a virtual circuit in an SNA network as well.

What this boils down to is that, for the majority of IBM users, while there may be valid reasons for not going immediately to SNA, X.25 is not one of them. Only in the very special situation in which a very large user is contemplating a dedicated packet net could this conceivably be an issue. Were this the case, however, there would probably be more satisfactory options than building one's own packet net.

In general, users relying on one primary mainframe vendor are unlikely to have a better alternative than that vendor's basic methodology for telecommunications and networking. However, particular components may be available in superior form elsewhere. Various vendors, for example, offer second-source communications controllers and cluster and terminal equipment which either use the mainframe vendor's communications facilities differently and/or provide alternative ways of doing things. This is not so much a matter of different standards as of more cost-effective means to obtain functional compatibility or additional capability for equal cost.

William F. Zachmann is director of research at International Data Corp.‡

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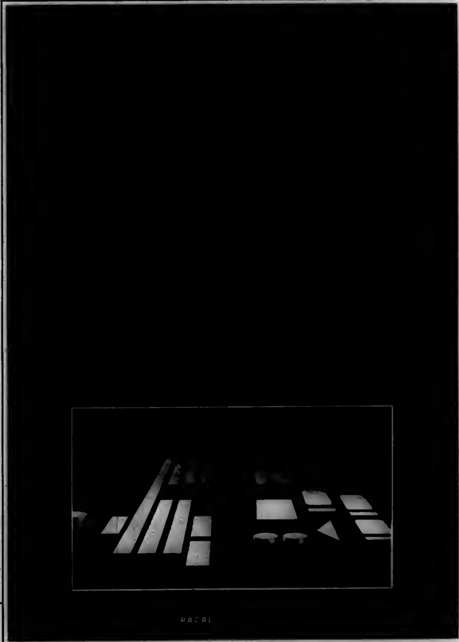
'While there may be valid reasons for not going immediately to SNA, X.25 is not one of them.'



Networking standards.

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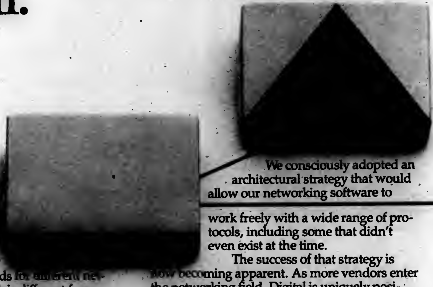


By now, everyone understands the need for standard communications protocols. Without them, an electronic Tower of Babel would surely ensue. But there have to be different standards for different networks. A local-area network is different from a wide-area network. A public network is different from a private one.

No single universal standard has emerged. Nor is one likely to. There are simply too many diverse networking environments, each fulfilling specific, mutually exclusive needs.

That's why Digital is committed to supporting and, in fact, actively promoting the more important standards now surfacing in the various environments.

Our goal is to offer our customers a range of standards to achieve any combination of networking objectives. And we've been pursuing that goal for many years.

A forward-thinking strategy.

When we first developed our networking architecture, we understood the need for flexibility. We consciously adopted an architectural strategy that would allow our networking software to work freely with a wide range of protocols, including some that didn't even exist at the time.

The success of that strategy is now becoming apparent. As more vendors enter the networking field, Digital is uniquely positioned to offer compatibility with the emerging protocols. We've gone farther than anyone to assure that your options are open.

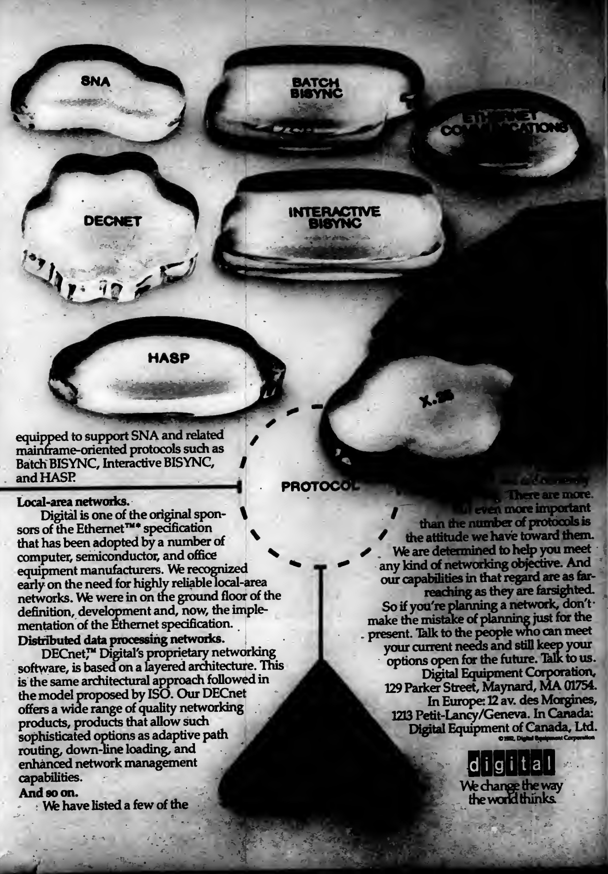
X.25 and other public networks.

Digital offers the X.25 protocol for use with public packet-switched networks such as Datapac (Canada), Transpac (France), and PSS (U.K.).

But when used with our computers, X.25 is much more than a simple link. We can provide you with the higher-level protocols that will take your systems beyond mere communications and into the sophisticated functionality that has made us a leader in networking software.

Hierarchical networks.

Even though we prefer to implement more flexible distributed networks, we are amply



equipped to support SNA and related mainframe-oriented protocols such as Batch BISYNC, Interactive BISYNC, and HASP.

Local-area networks.

Digital is one of the original sponsors of the Ethernet™* specification that has been adopted by a number of computer, semiconductor, and office equipment manufacturers. We recognized early on the need for highly reliable local-area networks. We were in on the ground floor of the definition, development and, now, the implementation of the Ethernet specification.

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And so on.

We have listed a few of the [illegible] There are more. [illegible] even more important than the number of protocols is the attitude we have toward them. We are determined to help you meet any kind of networking objective. And our capabilities in that regard are as far-reaching as they are farsighted.

So if you're planning a network, don't make the mistake of planning just for the present. Talk to the people who can meet your current needs and still keep your options open for the future. Talk to us.

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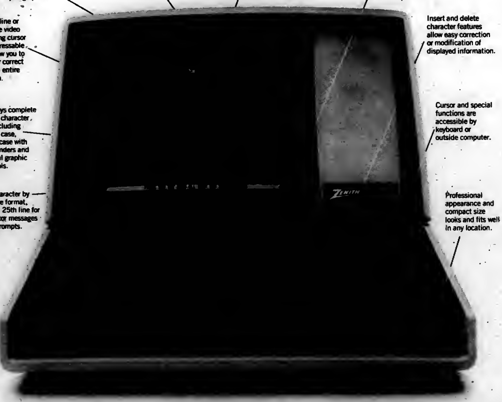

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PERSON-TO-PERSON COMMUNICATION:
DP'S MOST CRITICAL INTERFACE

Managing a large computer center requires more than dealing with computers. In fact, the manager will probably spend most of his time with people and those people will have to work effectively if he is to look good. The secret of effective management is inspiring others to work well, whether those others work with computers or not. In a department that uses lots of hardware, the job of the manager is complicated because he has to interface with both his machines and his personnel.

Poor communication can be very costly for such a manager. Faulty communication can mean horrendous losses in both people time and computer time. It can mean the difference between retaining expert personnel or losing them; running departments with satisfied employees or adding to the pool of unhappy people in the profession; having satisfied customers who come back for more software and hardware or dealing with dissatisfied customers who sue.

The *New York Times* recently reported that litigation from disgruntled customers is a growing problem among computer manufacturers and retailers. Litigation means lost accounts, bad publicity and lost money. (In one case, the out-of-court settlement was $2.3 million against Electronic Data Systems Corp., a Dallas computer service.) Many of these problems, however, are not caused by downtime, but by poor communications. Managers must be able to communicate managerially to communicate effectively.

What is managerial communication? Imagine the following: A salesman desperately wants to sell a particular piece of hardware. He is working on commission and does not make any money unless he sells the machines; also, he himself is dazzled by what the machine can do and by what he can make it do.

The man to whom the salesman is trying to sell the hardware wants desperately to believe in it, too. He owns a small printing

By John L. DiGaetani

Listening, speaking, reading, and writing are the skills a successful manager needs.

company and has been renting an old IBM that does most of his billing. Now he wants a machine that will do all his billing, handle his cost accounting and be a word processor as well. His company will then be able to do its own newsletter. He has other reasons for wanting the machine: He wants to own a piece of this dazzling computer-magic world. He has heard these machines can give him and his company a most fashionable business mystique and he wants his company to have that aura.

The owner therefore signs on the dotted line and buys the equipment, which the salesman assures him is easy to operate simply by reading the self-explanatory manual. The machine just has to be plugged into the present power source, flipped on and the glittering marvels of the 21st century will be at the owner's fingertips. The equipment is delivered and all is silent for a month. Then the ugly phone calls begin.

Enter the Sales Manager

What began as a marketing problem has now become a management problem, for now the sales manager comes into the situation. She has to deal with an angry customer who is very unhappy with the new equipment. It is not doing what he wants it to do and what the salesman told him it would so easily do. The manager tries to deal with the situation with several phone calls, realizes it is really a mess and goes to talk to the owner of the printing company.

The owner has been badly frustrated by the printed instruction manual. It is clear he does not understand it. Although the salesman (who is a trained technician) dismissed the manual as very easy to comprehend, the layman is completely baffled.

In addition, the sales manager has realized that the personnel at the printing company will have to be completely retrained or replaced if the new system is to work. And, although some of the old system's software can be used with the new system, some new software will have to be designed. Finally, the new system will have to be phased in gradually as the old system is being phased out before the final switchover can successfully occur.

The manager can produce a satisfied, happy customer, but ultimately the account will mean lost money to the firm because of all the time she will have to expend. What was the essential problem? Communication.

What exactly did this successful manager do? The manager sat down with the customer and flipped through the pages of her portfolio on this project to a computer printout titled "Designed for Future Flexibility: New Software, Old Software." She ran her pen down this page, underscoring key words or phrases, which she in turn elaborated on and explained. The client asked several more questions to which she responded. Before she left, the client asked for a copy of the prospectus and for time to consider the possible options and final costs of the new plan. The manager also promised to write a detailed plan in simple English (not computerese) for the new installation and to send it to the customer within a week.

This manager coordinated at least four processes for this human interface. She listened, she spoke, she read and, when the time comes, she will write. What she writes will have to deal with some negative points and some options for the future, but this will not prevent her from promoting her product as one thet is reliable and suited to her client's needs, although in need of particular care and attention. And, as a manager, she will work to protect her company from litigation that can result when salespeople promise the impossible just to make a sale. Indeed, this is a major part of her message and intent.

Those who think this manager's only job is to answer questions that her sales force cannot answer have a naive concept of communication. Her client will put little faith in her advice or information if he does not believe she is an able and knowledgeable manager. Her job, then, is not only to say correct things that will solve problems her sales force cannot solve, but also to say them in a way thet wins respect and support for herself and for her company.

Listening, speaking, reading, writing — and interfacing all four effectively — are the skills the successful manager needs. In the DP field, the manager also needs to be able to interface all this with people and machines.

Leaving nothing to chance means knowing exactly what strings to pull, and here managerial communicators have the edge. They can read for professional power, listen to find out exactly what they need to know, write to get action and support from others and speak so others will listen to them. Managerial communication, involving the integration of all four processes, will remain at a successful manager's disposal throughout his progress in a career with computers — and with people.

Not all people can get what they want even if they deserve it. To write the kind of budget reports and sales letters thet an efficient computer manager needs involves being aware of your audience. Can you write a memo thet will motivate your staff to change its design procedure? Can you write a report to get upper management to continue your project rather than dismiss it as a kludge? Can you write to upper management to convince them to give you a promotion into their ranks? These are important tests for the computer manager who wants to succeed and to rise within a company.

It is the awareness of audience, coupled with a knowledge of how English is properly controlled, that leads to managerial communication in writing. The best programmer will not necessarily be made manager of the department if he lacks such skills. It is also awareness of audience thet distinguishes the successful manager when he speaks. He can go to his board of directors and convince them to buy a new line of hardware or to allocate a larger budget for his department or talk to his people and convince them that productivity must increase.

But managers are often inundated with things to read — professional periodicals, company reports, memos and letters. To run a computing department today means trying desperately to keep up with all the latest developments in a fascinating but changing field. Being able to read managerially means not wasting your time as a reader. It means being able to keep up with the latest developments on software. It also means knowing about the latest Japanese research in chips and trying to top it. It means knowing exactly how computers can work in education, especially if your company is planning a new piece of hardware for this area.

Recent studies on how managers spend their time indicate they use much of it listening to other people. How much does the manager absorb? Can he listen efficiently enough to understand a complaining customer, an angry worker, a worried division head and a whining machine? Can he design a machine for a klutz, as Savvy and Excalibur are trying to do? These projects were the results of listening carefully to customer complaints.

Communication is most crucial in a field dealing with machines. This sounds paradoxical, yet it is not. The computer field really deals with people through machines. Modern computers are technical, sensitive, complex, interconnected and easily dated by new products. People are all of the above, but more so. The successful manager can interface man and machine for the greater good of man.

John L. DiGaetani teaches management communication at the Harvard Business School.

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By *Jerry Cashin*

OPEN SYSTEM ARCHITECTURE:

THE ULTIMATE WINDOW ON THE WORLD?

Can it happen? Is it possible to enable each system entity in the world to have the potential to communicate with any other system entity or group of system entities — no matter what the lineage, physical characteristics, functional idiosyncracies, parochial requirements or inbred incompatibilities?

In more specific terms, any computer network or component thereof would be able to talk to a counterpart in another network or location without concern for the different characteristics or procedures of the communicants. Is a concept so staggering in its implications for component design and industry cooperation capable of achievement? If so, when will it occur? The answer to the first question is yes — with reservations. On the technical level, such communication is certainly attainable, although much development work remains to be done by the dedicated national and international groups working on the problem.

When will it happen? A policy of walking before running is a sound principle here. Many optimistic implementation guidelines exist. The probability is that a policy of gradualism will ensue.

A good estimate on the matter of timing might be to say that "seepage" of these concepts will be seen throughout the marketplace in the '80s, with firmer and more significant customer impact occurring in the following decade.

If open systems is so far away, why then devote any time at this point to its somewhat murky future? Should we not simply place it on our mental back burner and continue to pursue solutions to contemporary situations? Although that is one possible approach to this burgeoning concept, it is not

'It is quite in vogue at the moment to assault the premise and performance of SNA.'

recommended for a variety of reasons:

- Open systems (or various subset versions thereof) is coming, perhaps not in the immediate future, but certainly farther down the road. As a consequence of this fact, we shall be encountering ever-increasing volumes of detail on its characteristics.
- Development teams here and abroad are staffed with some of the most talented professionals now available in systems design and engineering.
- Most important, open systems represents the most important system development effort under way at present; it promises to have more impact on the field of automated communications than any related project currently being considered. It will literally revolutionize data transmission procedures and result in an almost frightening growth of information transfer of both the written and visual types.

Developmental History

In a review of the panoramic breadth of contemporary computer automation, it is possible to delineate three broad generations in the development of open systems (think of it, for the moment, as distributed) technology.

One might declare that the era of information systems distribution emerged initially when communications lines were first attached to a centrally located computer configuration. Examples of these early and somewhat limited embryos include time-sharing implementations, remote batch facilities (a la 2780 processing) and airline reservation systems connecting ticket agents to mammoth central installations, usually in another city. All these activities characterized the first generation of distributed systems. They reflect a dispersal of the I/O function only and were one-dimensional, although very serviceable.

The logical extension to distribution of I/O components was decentralization of computer processing capability. Thus, the second generation of distributed systems was marked by geographical shuffling of processors as well as I/O equipment. Arpanet is a prototypical second-generation system. Other examples are company proprietary networks such as IBM's Systems Network Architecture (SNA), Digital Equipment Corp.'s Decnet, Sperry Univac's Distributed Communication Architecture (DCA), Honeywell, Inc.'s Distributed Systems Architecture (DSA) and others now appearing with frenzied regularity.

Of the proprietary networks, SNA is light years ahead of most in design history, scope of implementation and validatable performance claims, although a few of the competitors are not far behind. There are some other touted networks (not necessarily any of those mentioned earlier) that represent nothing more than flim-flammery. The caveat emptor dictum of ancient times still applies when a user listens to the claims of present-day proselytizers for network wares.

It is quite in vogue at the moment to assault the premise and performance of SNA, despite — or maybe because of — its more than 1,000 installations. It is somewhat similar to an attack on any venerated institution of relatively long standing. After you have climbed the mountain and inhaled the heady air of long-sought heights, it becomes very fashionable to demean some aspects of the torturous ascent. However, it should be remembered that, to some degree, SNA principles are embodied in the constructs of open systems architecture and that SNA is an operational, viable system product — quite unlike some (not all) of its heavy-breathing competitors.

Third Generation

We now arrive at the third generation of distributed systems: distributed I/O, processing and data bases as appropriate to the application. More important, the concept of open systems with its accompanying internetwork communications now comes to the fore — not just communications among homogeneous "computer family" networks, but meaningful dialogue among heterogeneous, dissimilar networks spawned from different manufacturers. National and international standards development groups are relentlessly moving ahead in this area with amazing results, although much work remains to be done.

The U.S. effort is spearheaded by American National Standards Institute's (Ansi) Technical Committee X3T5, under the chairmanship of Richard des Jardins of Computer Technology Associates. The National Bureau of Standards (NBS), a department of the federal government, is concurrently working on protocol specifications for internetwork communications. Within the international community, the International Standards Organization (ISO) has created Subcommittee 16 to deal with open systems. It designated this group as ISO/TC97/SC16 and named as its chairman Charles Bachman of Cullinane Database Systems, Inc. Bachman at one time also served as leader of X3T5's predecessor's investigative team.

The whole open systems study task really took shape for the first time in late 1976 on an initiative by the British Standards Institute (BSI). It is not surprising that Europe was the source of such activity; the European modus operandi in communications emphasizes standardization and government intervention. This is almost necessary because of the close proximity of sovereign nations, the Common Market psychology of cooperative interaction and the long European tradition of official or quasi-official media resources. These characteristics are not absent from the American experience, but U.S. priorities have emphasized a diversity of entrepreneurship while retaining logical control of events.

BSI recognized that any effort to provide higher level interconnection across diverse computer lines and national boundaries required an international standards effort to coordinate the activity. It was also apparent that ongoing development work by the growing number of vendors in the field would quickly result in a situation where any thought of cooperative interaction was not possible without immediate action.

BSI therefore requested that ISO, within its TC97 technical committee responsible for computers and information systems, initiate a subcommittee to attack the escalating problem of proliferating incompatability. The subcommittee's mission would be to standardize what BSI referred to as Open Systems Interconnection (OSI).

Broadly stated, the goal of OSI is to define standard protocols and interfaces which would enable people, terminals, computers and physical processes to exchange information among themselves without cumbersome intervention mechanisms. A utopian goal, perhaps, in light of the realities of the commercial marketplace, but visionary in its global perspective and appeal.

As a result of this early activity, ISO created a new subcommittee, SC16, during the first half of 1977. Administrative responsibilities were assigned by ISO to the U.S. delegation. Within the U.S. itself, Ansi established a study group on distributed systems to advise the standards body on which path it should explore and what positions should be formulated in the national interest. This group met for the first time in August 1977 to refine a program of work. Its primary goal was to create a reference model by which the diverse elements associated with distributed systems could be identified and studied.

In the early spring of 1978, the ISO member countries interested in OSI/distributed systems met in plenary session for the first time in Washington, D.C., as Subcommittee 16. The charter delegations in attendance besides the U.S. were Canada, Germany, France, Japan, Britain, Italy, Sweden, The Netherlands and Switzerland. The general views of all participants were found to be amazingly similar in defining the problem. As an outgrowth of this first meeting, the first written treatise on the nature of open systems was developed. Events were set in motion that will ultimately lead to a revolution in the manner in which information processing is delivered.

Since the 1978 charter meeting, forward movement has been halting at times, not surprising in view of the complex issues facing those early pioneers. Broadly speaking, however, they have come a long way in a relatively short time frame. Progress has resulted from cooperation among diverse nations, with U.S. input playing a significant role in achieving the present state of development.

Issues in OSI

To this point, the major emphasis of technical experts laboring in the OSI area has been in creating a reference model from which the actual standards and protocols will evolve. In other words, before one documents a set of driving rules, something must be known about the terrain to which they will apply.

The OSI Reference Model is an attempt to define the problem at hand, to circumscribe the issues pertinent to open systems and to provide a uniform basis for coordinating OSI stan-

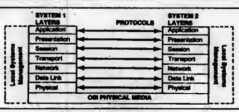


Figure 3. OSI Protocol Layers

dards generation. It is also intended that existing standards be accommodated to the maximum extent possible. The reference model is not slated to be rigid in any way, being able to absorb new technology and user demands as the concept of "system openness" grows and expands. It is the intent of the reference model to provide the framework for consistent generation of subsequent operational standards and protocols.

The development of the OSI Reference Model has been based on a concept of cooperating applications entitled application processes. It does not specify protocols and services, however, nor does it outline system implementation specifications. Each application process (think of it as existing at a workstation) is capable of communicating with other application processes. They may be automated, physical or manual in nature. Those within the node (or computer system) are automated processes and those external to the node represent manual processes. There may also be physical processes in this scenario, such as found in industrial robotics and sensor-controlled manufacturing procedures.

All systems require resources to fuel the activities of their workstations. A manual system would consist of a mix of people, documented procedures, files and incoming and outgoing messages associated with the manual process that is being supported. In an automated system, people are to some degree replaced by computer resources, procedures may be software-implemented, files could be structured data bases and so on. Industrial systems would also include sensors and related analog measurement tools used to control an industrial process.

The fundamental purpose of OSI is to permit application processes located within a workstation to communicate with those located anywhere else whenever interconnection by any method is possible. Note that the corresponding application processes could also be in the same workstations or in another workstation within the same open system. Some pundits have projected that the primary means of system interconnection will be via public data networks, which at present are spreading rapidly throughout the industrialized West.

Architecture Chosen

In this age of structured, segmented, top-down solutions, the architecture chosen for the OSI Reference Model operates in perfect harmony. The adopted concept of layering permits division of the complex OSI problem into independent functional layers, each with a well-defined set of responsibilities. The inbred modularity of the design allows change to one layer without disturbing any other layer. This situation enhances the integrity of the overall architecture. Figure 1 illustrates the seven protocol layers associated with OSI design.

Each layer consists of one or more "entities." Those in the same layer are referred to as "peer entities." With the exception of the highest layer, each layer provides services to the layer immediately above it, using as building blocks the services provided by the next lower layer. Specifying classes of these service types (and categorization thereof) is one of the pending action items for OSI project team development. Protocol classification is undergoing similar scrutiny.

One of the more important issues associated with OSI architecture is that of overall management. In a peer-to-peer environment with no master/slave relationships, management concerns can be difficult to specify. The model identifies the following management types, with related activities.

Application Management (applicable protocols reside in Application Layer):

1. Initiate, maintain and terminate application processes.
2. Assign and cancel OSI resources associated with application processes.
3. Integrity, commitment and security control.
4. Checkpoint and recovery control.

Systems Management (applicable protocols reside in Application Layer):

1. Activation, maintenance and termination of distributed resources throughout an OSI configuration.
2. Program loader.
3. OSI parameter initialization and modification.
4. OSI monitoring (status, statistics and so on).
5. Error-detect and diagnostic activities.
6. System restart.

Layer Management

1. A subset of Systems Management for each specific layer.
2. Layer initialization and error control.

The OSI Reference Model does not legislate the degree of centralization for management functions, leaving this decision to the vagaries and requirements of specific implementation.

The Application Layer is the highest layer in the OSI Reference Model (See Figure 1). Some of the services provided include information transfer, status of intended communicants, performance monitoring of the information transfer function, synchronization of communicating applications, error recovery agreements and so on. This layer executes the application-to-application communication between processes, which forms the driving element of OSI architecture.

The Presentation Layer controls the display, entry and exchange of structured data being transferred between application entities. Examples of presentation standards or protocols are Ascii, virtual terminal procedure, virtual file protocols and so on. The end result is a consistent data structure throughout a distributed environment.

The Session Layer's primary responsibility is to initiate and manage a session connection among cooperating presentation entities, including the procedural steps necessary to maintain orderly communication and control. In order to initiate data transfer, a session connection is mapped onto and uses a Transport Layer connection. The preceding three layers are the users of transport service.

The Transport Layer represents the dichotomy between the functional and logical concerns evidenced by the Application/Presentation/Session layers and the data movement and control responsibility offered by the Transport/Network/Data Link/Physical layers. The Transport Layer provides transparent data transfer between two session entities. Areas of control include quality of service options, multiplexing, flow control and error control.

The Network Layer allows network connection between two open systems. This includes intranetwork routing and switching protocols for open networks, plus internetwork protocols, which can be implemented at gateways between networks. The quality of service available at the Network Layer may be subsetted in order to reduce overall cost.

The Data Link Layer promotes reliable data exchange between equipment connected by a single physical link. Where possible, a primary objective of this layer is to detect and correct errors that arise during transmission across the line. In addition, data flow across the link is controlled by the Data Link Layer.

The Physical Layer provides for the physical, functional and procedural elements necessary to initiate, maintain and terminate the physical circuits between separate equipments.

IBM's SNA

It was less than 10 years ago that IBM alone manufactured or otherwise marketed more than 200 communications products. In support of this maze of hardware, the giant computer firm offered 35 versions of teleprocessing access methods and 15 separate line control methods. The burgeoning complexity of designs and choices threatened to engulf system planners unless something dramatic was offered to parameterize the problem. The "something" was Systems Network Architecture.

Since 1974 when it was introduced, SNA has undergone continual

'OSI's inbred modularity permits changes to one layer without disturbing any others, thus enhancing overall integrity.'

'There is no observable similarity between SNA layers and those represented within the OSI structure.'

change, with the addition of expanded features and improved flexibility. The treacle-tongued critics of contemporary automata often find it fashionable to belabor SNA, but it is in the mainstream of current system design. It is certainly not perfect, nor even necessarily superior when judged in the astract, but it does offer a workable system solution to distributed access, dispersed data and network management.

History of SNA

- SNA-0 (1974) — Supported single-computer networks of terminals and communications controllers using leased lines. There was only a single transmission path between the host computer and its terminal counterpart. For the first time in a universal design, one terminal could access more than one application, albeit with no interaction between the successive applications.
- SNA-1 (1976) — added a capability for attachment of a remote 3705 to a locally situated 3705 using communications lines. Also increased the volume of products support.
- SNA-2 (1976) — Yet more products supported, plus capability to attach cluster controllers and terminals using dial lines.
- SNA-3 (1978) — Introduction of network concepts to SNA invoked. A terminal in a tree network controlled by one host was now able to access an application within a host associated with another tree network. Intermediate networks could be employed in transversing from one host to the other. Resource sharing and backup for ailing hosts became feasible. Transmission speed was upgraded to 9,600 bit/sec to 56K bit/sec, full duplex. Network management and control programs were adapted to the SNA environment.
- SNA-4.1 (1979) — Permitted attachment of non-SNA and non-IBM terminals via the Network Terminal Options. Offered cryptographic services and dynamic configuration capabilities.
- SNA-4.2 (1980) — Added multiple communication paths between terminals, hosts and cluster controllers. Instituted improvements to flow control procedures.

In late 1980, IBM announced support for the CCITT X.21 and X.25 standards. This significant step permitted users to communicate across public data networks. More important, it signified a measure of commitment to OSI principles. The X.21 standard defines the Physical Layer interface, whereas X.25 is concerned with the lower three layers of the seven-layer model.

From a design standpoint, SNA is basically two-dimensional. The functions performed at each node are organized into the ubiquitous layers already referred to with OSI, but with a somewhat different structure. The layers are logically independent in order to support nonintervening change — they are essentially standalone in functionality.

As the message winds its way through the layers in Node 1, it has headers appended by the successive layers through which it has passed. These headers (and sometimes trailers) contain instructions and parameters that are needed by Node 2 to determine how to handle the incoming message. This overhead data is successively "stripped off" at each layer in Node 2 as the appropriate headers and trailers are "decoded" in order to determine what action must be taken to ensure eventual delivery to the recipient end user.

The principles employed here are identical to those applied by similar layers in OSI, although implementation specifics between SNA and OSI are not in perfect conformity.

The layer entitled Presentation Services provides a variety of support services for application programmers or operators typified by data formatting for printing or display. The Data Flow Control Layer coordinates requests and responses, controls sequencing of messages and manages chaining and bracketing of transmissions. The Transmission Control Layer deals with message pacing and encryption. The Path Control Layer selects the physical links and logical routes by which a message is transmitted, along with enhancing system flow control. Finally, the Data Link Control Layer schedules data traffic and implements error control on the data links. The Physical Layer implanted in OSI is not separately defined in SNA, but is present beneath the Data Link Control Layer.

The obvious advantages of SNA vis-a-vis previous information transfer schemes are user simplification of the use of complex configurations, improved resource sharing, heightened advocacy of distributed system design, orderly design modification and installation growth. An additional fallout, assuming proper implementation of SNA tools, should be an upgrade to overall system performance.

There is an observable similarity between the layers found in SNA and those represented within the OSI structure. This relationship is best described in terms of three groupings of OSI Layers: the Physical and Link; the Network, Transport and Session; and the Presentation and Application Layers.

As declared earlier, there is no separately defined Physical Layer in SNA. It is present below the SNA Data Link Control Layer. The functions of the Data Link Control Layers in both OSI and SNA are very similar, however, in that each is concerned with single link transmission and overall management of individual links. Where the OSI Link Control Layer may support multiple links between adjacent network nodes, in SNA the equivalent service is provided in the Path Control Layer.

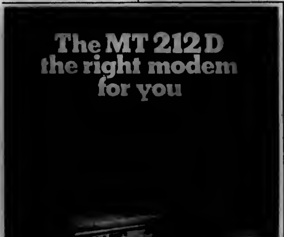
The functions present in the OSI Network, Transport and Session layers are found in the SNA Path Control, Transmission Control and Data Flow Control layers. For example, message routing, provided by the OSI Network Layer, appears in SNA's Path Control Layer; Transport Layer flow control is carried out in SNA's Transmission Control Layer; and OSI Session dialogue is contained in the SNA Data Flow Control Layer.

Activities associated with OSI Presentation and Application layers have no direct layer correlation in SNA, but are dispersed throughout various system design entities. This reflects the inevitable different handling of upper layer procedures by almost any design team approaching a level of abstraction as represented by Presentation and Application services. For example, end-user interactions within SNA are instituted by the Logical Unit Services Manager, rather than being placed in the Application Layer as found with OSI design.

Despite the differing details of system specifics, one can see the inherent similarities of discrete architecture utilized by both OSI and SNA. Almost without exception, these same similarities exist in other company-developed network architectures — that is, layered functional independence in a hierarchical framework. Thus, OSI principles have indeed emerged from the mainstream of contemporary technological design, but must also address the issues of a much wider and demanding interaction among potentially diverse correspondents.

As of this writing, the OSI reference model has been proposed as a draft standard. Achieving this status will not prevent it from evolving in the years ahead. Specifically, such issues as local-area networks, electronic mail services and text transmission undoubtedly will result in further alteration and development of the reference model in order to recognize these emerging services.

Jerry Cashin, who lives in Berlin, Mass., writes frequently on computer topics. ◆



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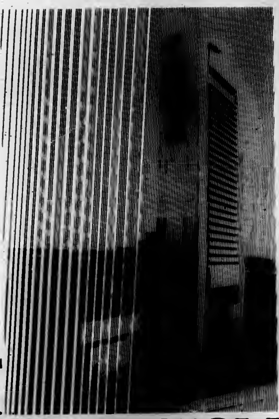


By Bennett B. Quillen

DATA TRANSMISSION SERVICES IN BANKING AND FINANCE

You just got a call from your corporate treasurer this morning and he's starting to talk about trying to get information from your local bank's lockbox to update receivables automatically. Or, perhaps the treasurer is talking about some remote disbursing point and linking it to some kind of automated reporting system in conjunction with cash concentration through an automated clearinghouse. Or maybe he's talking about zero-balance accounts and targeted cash balances to be used for automated investment in repos and other money market instruments.

Why the sudden plethora of acronyms and new terminology? Because we have entered the era of cash management. What is

'It is in the corporate sector that electronic funds transfer will have the greatest impact.'

cash management? Why now? What are its tools? Where is it going? And, perhaps most important, what impact does it have on you as the data processing manager?

Cash management, or perhaps more appropriately funds management, is a corporation's way of forecasting, transferring, controlling and using its funds inflows and outflows for potential investments and debts service. It is important to bear in mind that every dollar that is not invested when it could be or that is expended too soon for the payment of debt is, in financial jargon, a lost opportunity or opportunity cost. The objectives and techniques of cash management are explained in the accompanying articles.

Why is cash management so important now? Have we not always had these objectives? Yes, but a combination of factors — inflation, historically high interest rates and a general squeeze on corporate earnings with corresponding pressure on accelerated salary, raw material, inventory and transportation costs — have all placed an increasing emphasis on very good cash management.

Many cash management services such as remittance processing, wire transfers and manual depository transfer checks and preauthorized drafts (see accompanying story on Page 60) have been available to the corporate and governmental community for many years. However, recent advances in electronic funds transfer (EFT) at last permit the corporate treasurer to recycle funds for investment or debt retirement purposes.

Of course, all of this will have an impact on the velocity of money, corporate demand deposit balances and float. As money is moved around faster, banks and corporations will not be able to use float and compensating balances to pay for bank services as much as they have in the past. The offsetting benefits are that both corporations and banks will be better able to quantify their rates of return on investments and their cost of capital as they become better informed of their funds position.

EFT Comes of Age

Electronic funds transfer tends to receive more publicity in retail areas such as automated teller machines and point-of-sale terminals than it does in corporate applications. However, it is in the corporate sector (including government agency and corporate accounts) that EFT will have the greatest impact. Some of the major organizations involved with EFT include:

- National Automated Clearing House Association (Nacha), which is a consortium of regional automated clearinghouse associations. Its purpose is to provide the rules and standards for interregional ACH transactions and to develop, promote and administer a system of exchange and settlement of entries between ACHs.

At present, there are 32 ACHs, including approximately 13,000 member banks and thrift organizations and about 10,000 participating companies. Each month, private and government transaction volume transfers about $11.5 billion and $40 billion respectively through ACHs, an amount representing about 10 million items each month.

- Fed and Bank Wire. The Fed Wire is operated by the Federal Reserve System and is available to its member banks. Financial data is transferred by effecting electronic transfers of funds and securities, thereby reducing the actual physical movement of items.

Bank Wire is a funds transfer system complementary to Fed Wire and is used primarily for administrative messages. These messages of transactions may be on a same-day basis or may be warehoused for several days and retrieved by the receiver at a later date. Bank Wire can interface to TWX and, in the near term, with ACH.

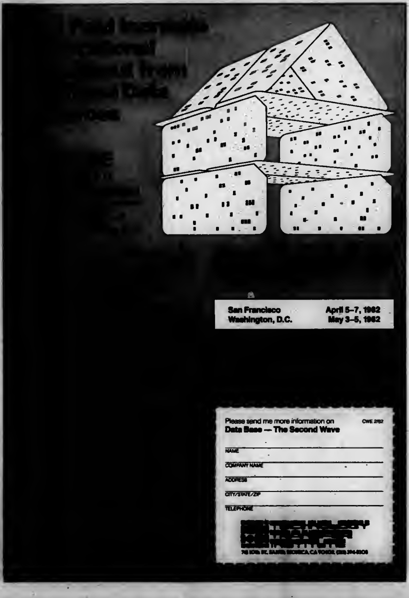
Bank Wire has also been updated to provide messages via video display terminals as well as through traditional wire mechanisms.

- Clearing House Interbank Payments System (Chips), an automated network for the clearing and settlement of domestic and international payments. It provides settlement of net positions among member banks on a same-day basis through the Federal Reserve.
- Society for Worldwide Interbank Financial Telecommunications (Swift), which is a cooperative bank funds transfer system that provides a network between Europe and North America. It transfers funds and does message switching on a worldwide basis.

Benefits of EFT

All of these organizations and technology will serve to:

- Improve and expedite the transfer of funds.
- Improve telecommunications at lower cost.
- Increase the usage of balance reporting systems.



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In the past, banks were the primary providers of the array of cash management services, but this is no longer true. A number of third-party vendors are very active in funds transfer networks. Nonbank institutions such as Merrill, Lynch, Pierce, Fenner & Smith and Sears and Roebuck are also becoming involved in providing wire and computer-to-computer transfers to their own widely dispersed facilities and offices. Such services could be made available to other corporations. (See Figure 2, Page 60.)

Equipment and Communications

What is the impact on you as DP manager? What will be your considerations in terms of software, equipment and communications facilities?

The major considerations in equipment are modems, terminals, control units and communications lines. In selecting a modem, one needs to consider three factors:

- Line protocols.
- Line speed.
- Terminal configuration.

Line protocols are basically bisynchronous or asynchronous. A bisynchronous protocol permits acknowledgment and negative responses with error correction and retransmission capability. In a dial-up mode, where transmission is periodic and relatively low in volume, line speeds of 2,400 or 4,800 bit/sec are available.

The terminal configuration is either a remote job entry or an interactive device emulating 2780/3780 or 3270-type terminals. This is an appropriate operating mode for most cash management transmission requirements.

An asynchronous protocol also functions in a dial-up mode, but at speeds of 300 to 1,200 bit/sec. It does not have error correction and retransmission capabilities as part of the line protocol. Such features can be programmed by one's own staff and used for intracompany transmission. An asynchronous protocol is frequently used in an operation where paper tape is punched off-line and then transmitted.

Faster line speeds are available by means of leased or dedicated lines. For example, Bell modems can transmit at 9,600 bit/sec and Paradyne Corp. modems at 14K bit/sec. Racal-Milgo, Inc. expects to produce a modem competitive with Paradyne's this year.

Finally, "modemless" speeds of 56K bit/sec are possible by means of Bell's Digital Data Service over leased lines.

Communications Controller

The communications controller is vital to a telecommunications network and is available from a variety of vendors, including IBM, Burroughs Corp., Memorex Corp. and Paradyne. The communications controller connects modems and other telecommunications devices (terminals, remote job entry devices, automatic teller machines and so on) to CPUs (see Figure 2).

Data processing must be concerned with its transmission format. Nacha developed a standardized format in 1976.

This format is relatively complicated to enable it to be used for direct deposits or preauthorized payments. The records may include dollar amounts, debit and/or credit codes and trace numbers to locate a particular item at a subsequent time.

The Bank Administration Institute format is relatively uncomplicated and was developed many years ago for use in remittance processing. It is used principally for lockbox applications and incorporates dollar amount, number of items and so on.

Applications Considerations

The two major considerations are:

- Providing the corporate treasurer

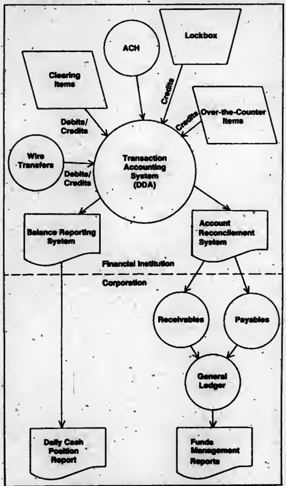

Figure 1. Funds Management Systems

A firm's internal wire and computer-to-computer transfer services could be marketed to other corporations.

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The DP manager must let the corporate treasurer know his total cash position — assets and liabilities — daily.

Cash Management Objectives

What are the traditional objectives of cash management? A brief review of accounting principles will shed some light on this. In an accounting or cash cycle, sales are turned into [illegible] receivable, which [illegible] then [illegible] chasing [illegible] and equipment, for [illegible] and for other [illegible]. The fundamental [illegible] management are [illegible] accelerate the [illegible] and decelerate or [illegible] practical) postpone the [illegible] side. The principle functions of cash management are to:

- Accelerate deposits so monies are collected as quickly as possible, thereby reducing the company's increasing float. Float has various shades:

Mail float (the time it takes a check to move from the payer to the payee), processing float (the time within the payee's operation) and collection float (time to clear through the banking system). Reducing float days has a direct bearing on investable funds or, conversely, on the funds available for retirement of debt.

- Concentrate cash. Many companies have widely dispersed plants and sales offices, each one requiring or receiving funds as part of its operations. If these funds could be concentrated in one area, they could be controlled and utilized more effectively.

The acceleration and concentration of funds can be accommodated by several methods, including lockbox processing, wire transfers, [illegible] transfer [illegible] and [illegible] accompanying [illegible] 61.)

- [illegible] cash disbursements to [illegible] having [illegible] idle in [illegible] payment of [illegible] future [illegible] are [illegible] payment of [illegible] controlled disbursements, payable-through-drafts and zero-balance accounts.

- Report on funds availability, which is really information management. This is where you as the DP professional play a key role. It is important for the corporate treasurer to know his total cash position daily, both from the asset or receivable side of the balance sheet as well as from the liabilities or payable side.

The treasurer must know his cash position regardless of the dispersion of operations and the number of banking relationships the firm may have. He must also have a handle on the projected cash inflows and outflows on a weekly, monthly and quarterly basis in order to time his investments and to match fund amounts appropriately to ensure movement of funds in a smooth and orderly fashion through the corporation.

Outside sources play an important [illegible] infor- [illegible] is [illegible] are being [illegible] to using [illegible] to estimate the [illegible] accounting or cash cycle [illegible] to assist the corporate treasurer in matching inflows and outflows.

- Utilize excess funds. This is crucial to the bottom line corporate treasurers must preserve. All the above activities lead to this function.

Investment vehicles can include federal funds, repurchase agreements, money market funds, eurodollars, commercial paper and U.S. Treasury instruments; with the advent of the financial futures market, it can even include hedging. Other uses include reduction of outstanding balances on revolving debt, reduction of term loans and investment in capital purchases.

with timely financial reporting on funds liquidity, including matching of rate-sensitive and maturity terms of assets and liabilities.

- Building an automated input to the accounts receivables, inventory and payables systems for the bank or network balance reporting systems. These subsidiary ledgers then feed the general ledger for immediate posting and financial reporting.

To provide comprehensive information to the treasurer, assets and liabilities must be categorized by maturity and rate sensitivity. This can take the form of sources and applications of funds including value dating and yield or cost rates. Generally, long-term debentures and stock issues should equal or exceed fixed assets such as plant and equipment during periods of rising rates or when investment yields exceed the weighted average cost of long-term debt.

These "excess" funds can be invested (even electronically via wire) in short-term instruments awaiting future need to pay for such items as

(Continued on Page 62)

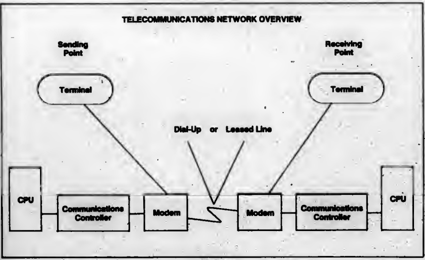

TELECOMMUNICATIONS NETWORK OVERVIEW
Sending Point
Receiving Point
Terminal
Terminal
Dial-Up or Leased Line
CPU
Communications Controller
Modem
Modem
Communications Controller
CPU

Figure 2

Cash and Collection and Concentration

Lockbox: On the cash gathering or concentration side we talked about lockbox or remittance processing. Lockbox is used to truncate checks or remittances at a central post office point in a region to reduce transit or mail float. These funds can then be deposited immediately into the company's account and may be invested. Furthermore, these remittances are now handled by an outside processor, which reduces the work load on a firm's accounting staff.

Wire Transfers: Wire transfers, coupled with a lockbox operation, can transfer funds on a same-day basis from a regional bank to a concentration account. There are fundamentally two wire-transfer systems. The cost justification for a wire transfer is predicated upon the interest rate, the amount of balances being wired and the cost of the wire.

A corporation may work through a bank that does not use either of the major wire transfer networks. The bank may work through a larger correspondent or it may transfer funds via Telex or TWX. This is especially true overseas.

Depository Transfer Checks: Depository transfer checks are generally the least expensive method of consolidating funds. They are nonnegotiable and are payable only to the company itself. A depository transfer check works in the following way: a company's local store deposits its day's sales receipts in a local bank. At the same time, it prepares a depository transfer check for the same amount of the deposit and posts this to the company's concentration bank. As the depository transfer checks are received from the company's various operations, the receipts deposited in the local bank are in the process of collection. When the depository transfer checks have been deposited to the concentration bank account, they clear through the banking system to be posted to the local depository account.

This manual depository transfer check has been taken a step further. Many companies will now telephone or wire the depository transfer check information to a concentration bank or perhaps some third party data collection point such as Automated Data Processing, National Data Corp. or General Electric Information Services Co. These third parties may then transmit over phone lines to the designated concentration bank, which may prepare and deposit the depository transfer check. In other cases, the concentration bank may receive the transmission directly, make a deposit for the total dollars indicated and prepare a magnetic tape to be passed through the automated clearinghouse network. In effect, the electronic depository transfer check eliminates the mail float factor and, in many cases, reduces collection float.

Preauthorized Drafts/Preauthorized Payments: The preauthorized draft or preauthorized payment is gaining wider acceptance. These are good alternatives to the cost of lockbox processing. A preauthorized draft is in reality a draft against a corporation's customer's account. In the past, insurance companies have used this vehicle to collect payments.

A preauthorized payment is the electronic equivalent of a preauthorized draft. The transaction passes through the automated clearinghouse network instead of the through the check-clearing network. The cost of preauthorized payments is lower than that of preauthorized drafts, and the availability gained from their usage is certain and often better than preauthorized drafts.

Both of these take the form of a preauthorized agreement between a company and the payer who authorizes his bank to accept these debits to his checking account.

In the future, the role of the automated clearinghouse will grow as a conduit for payments between corporations and to and from their suppliers and customers. This growth will result from the benefits preauthorized payments offer:

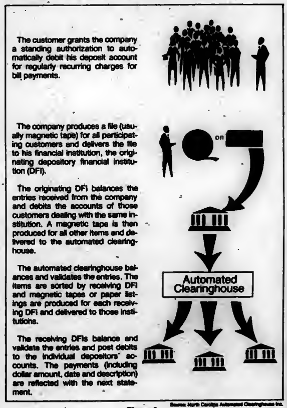
- The complete elimination of mail float and the reduction of processing and collection float.
- The effective reduction of postage cost and associated clerical costs of handling invoices.
- The reduction of potential collection and credit costs.
- The provision of up-to-date cash flow reporting.

A schematic of the way this process works is shown in Figure 3.

Cash Disbursements: Techniques for controlling cash disbursements include decelerated bill payment, payable-through drafts, zero-balance accounts and controlled disbursements. Decelerating bill payment — either through mailing it directly to the company instead of a lockbox or through a rural bank for control purposes — is one method of using mail and clearing time to the company's advantage.

Payable-Through Drafts: Payable-through drafts are check-like documents which are not drawn on the issuing bank, but instead are presented directly to the corporation for payment. These drafts are merely "passed through" the Fed and then on to the bank as a collection agent. This vehicle gives complete control to the company's cash manager, who may review each item before authorizing payment.

Zero-Balance Accounts: These are used primarily to control subsidiary account funding. As items are posted to a subsidiary account, the bank is authorized to make transfers from a parent or master account to cover these transactions. Such transfers return the subsidiary account balance to zero. Because deposits are made only to the parent account, utilization and reconciliation of bank balances is simplified.



The customer grants the company a standing authorization to automatically debit his deposit account for regularly recurring charges for bill payments.

The company produces a file (usually magnetic tape) for all participating customers and delivers the file to his financial institution, the originating depository financial institution (DFI).

The originating DFI balances the entries received from the company and debits the accounts of those customers dealing with the same institution. A magnetic tape is then produced for all other items and delivered to the automated clearinghouse.

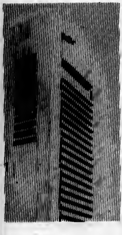
The automated clearinghouse balances and validates the entries. The items are sorted by receiving DFI and magnetic tapes or paper listings are produced for each receiving DFI and delivered to those institutions.

The receiving DFIs balance and validate the entries and post debits to the individual depositors' accounts. The payments (including dollar amount, date and description) are reflected with the next statement.

Source: North Carolina Automated Clearinghouse Inc.

Figure 3

The role of the automated clearinghouse will grow as a conduit between corporations, their suppliers and customers.



At some point, it makes sense to automate financial liquidity reports.

materials, supplies and salaries. In the interim, the yield on these investments provides additional cash inflow.

The timing of funds flow, including noncash items such as depreciation and amortization, is a result of capturing information like aging of receivables and payables, projected operating expenses, budgeted capital expenditures, debt servicing schedules and fixed-asset write-offs.

Much of this information may be extracted manually from reports from the individual systems. Frequently, summary financial data can then be manipulated manually or used in some ad hoc computer model that may already include the company's budget data. At some point, it makes sense (because of volume, clerical effort and cost) to automate much of this Input into financial liquidity reports.

A model gives the treasurer an opportunity to explore "what-ifs" of alternative investment vehicles. Obviously, if the model is a computer model, even a stand-alone system, these analyses can be accomplished faster and more accurately. If the model is a module or part of the general ledger system, so much the better, because the initial input is then automated.

General Ledger Interface

The other side of the funds management information is its link to the general ledger. By capturing and reconciling bank balances in a centralized fashion, information on ACH transactions, lockbox credits, wire transfer activity and check disbursement reconciliation, a composite net position is available on a daily basis (See Figure 1 on Page 59). In the future, greater use of ACH as a disbursement mechanism will be extremely important on the output side of general ledger.

These transactions can be posted directly to cash receipts and disbursements journals for posting to general ledger, giving a daily cash position.

Utilizing existing sales or order entry systems, finished goods inventory and accounts receivable can be appropriately posted. Of course, typical purchasing systems are used to charge raw material and accounts payable. These and other subsidiary ledger postings should be value dated for later retrieval and reporting of anticipated cash receipts and disbursements, which is the substance of a funds management report.

Systems Capability

Some existing systems accommodate these features as part of their modular data base approach. Most do not.

In providing these features for a medium-size or smaller firm, these capabilities should be part of a long-term plan of up to two or three years. In the interim, much of the information can be provided either in summary or in detail in a manual or semiautomated fashion.

Priority should be placed on providing the liquidity data as expeditiously and accurately as possible, then following through on the input requirements. First, work with your bank to receive balance and account reconcilement data for your cash journals. Second, tie these journals and other balance sheet items automatically, as far as practical, to the general ledger.

Conclusion

This is indeed the era of funds management. The DP director must recognize this fact and strive continually to enhance the company's systems to provide funds flow information for Investment and cash control. To provide this information on a timely basis, systems are evolving to accept and provide electronically transmitted funds. The focal point of these funds is the general ledger and its related systems. Consequently, the various receipt, investment and disbursement systems will have to integrate not only with the general ledger, but also with external electronic sources such as the automated clearinghouse.

Bennett Bruce Quillen II is vice-president of data processing at Boatmen's National Bank of St. Louis, St. Louis, Mo.

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By Elizabeth Ferrarini and Gail Farrell

TELECOMMUTING: HIGH TECH'S NEW COTTAGE INDUSTRY

Illustration: Lynne Fey

It will save fuel, employ the handicapped, expand a company's labor pool, reduce the need for office space, help working mothers and increase productivity. Sound like the latest variety of snake oil? It'a telecommuting, and its advocates claim all of these benefits and more. So far, only a relative handful of people are telecommuters, but as their number increases problems will also crop up. How are telecommuters managed? How is their performance evaluated? What type of jobs are suited for telecommuting? What type of people?

An estimated 15% of the work force (or 10 million people) will be telecommuters by the 1990s. Managers will have to grapple with a whole new set of issues if telecommuting is to work out well.

Telecommuting — or homework, or flexiplace — is a fairly simple concept. Employees work at home, performing jobs fomerly done in the office, and keep in touch with employers via telecommunications. The term telecommuter does not cover self-employed people.

Sparked by the microcomputer revolution, telecommuting uses small, inexpensive devices that easily fit into the home. The device may be a terminal with a printer or CRT, a word processor or a computer. It may have features such as electronic mail, teleconferencing, access to corporate data bases or remote time-sharing. The principle is the same: easy access to information regardless of where the worker or the information is located.

Some telecommuting pundits believe we have already entered the age of telecommuting — and that most white-collar workers already participate in it. Vincent Giuliano, a senior consultant at Arthur D. Little, Inc. (ADL) in Cambridge, Mass., contends that many of us are now what he prefers to call "teleworkers." Giuliano defines telework as "using telecommunications to expand the time and place of the work place. My virtual office for this interview includes a fireplace in a livingroom in a home in Arlington, Mass. Yesterday it included an airport, bar and restaurant. Information workers do about $80 billion a year of business outside of the physical office."

Control Data telecommuters rated themselves between 12% and 20% more productive.

Regardless of how telecommuting is defined, the full-time or even part-time teleworker is still a rare bird. And exactly how telecommuting works seems to vary with the individual. For instance, Tom Conroy, an office automation consultant at Control Data Corp. (CDC) in Minneapolis, has worked at home for the past year and half, developing a methodology and a program for implementing office automation projects.

"I probably spend 20% to 25% of my time at my home office," Conroy said, "but my objective is to spend about 40% of my time at home. I try to set up my work week so I can be at home when I need large blocks of uninterrupted time for planning and thinking."

Conroy has a CDC Plato time-sharing video display terminal at home which allows him to access data bases in his office. Although some people at CDC have his home telephone number, he prefers to use the answering service to cut down on interruptions. He calls the service several times a day and tries to answer all calls quickly.

In addition to consulting about teleworking, Giuliano is himself a teleworker. To illustrate how it works, he reviewed a typical week's activity. "Today I am going to send by electronic mail the abstract of a speech I will give next week. The speech would never make it by regular mail. I am also preparing another piece that will go out via electronic mail to an organization on the West Coast. Then I will finish writing a lengthy report here at home. I may go to the office to do final editing on a CRT terminal, and the final report will be printed out on the word processor in our San Francisco office."

Most of the time, Giuliano communicates with his secretary via telephone or electronic mail. If he has written something, he will call in and ask her to edit it or to reformat it and print it out. If he is writing a report, the final printing on ADL letterhead and mailing must be done in his Cambridge office.

Telecommuting is not the exclusive province of the manager or consultant, however. Both the Continental Illinois Bank in Chicago and Investors Diversified Services, Inc. (IDS) in Minneapolis are experimenting with telecommuting for word processor operators. Mary G. McArthur, operations officer at Continental, said the bank started a pilot program in 1978 with two people at home. A year and a half later, two more people were added. A Dictaphone central dictation system sends dictation to a recording unit at the operator's home. The operator types and edits the dictation at a Wang Laboratories, Inc. word processor that interfaces to the bank's electronic mail system. All four operators are mothers with young children at home.

IDS started a similar program in June of 1981. The company now has three operators at home, all of them mothers with young children, according to office automation analyst Susan Maahs. These women average four hours of work daily and are scheduled for definite hours. Telecommuting has proven so successful on this limited scale that IDS is now looking at telecommuting for executives.

Although most companies have only a small number of telecommuters, Batterymarch Financial Management Co., a stock brokerage in Boston, has installed terminals in the homes of all 30 of its employees, both professional and secretarial. All terminals access the company's two Prime Computer, Inc. 750 computers. Although all employees use the office, their home terminals let them work in the evening and on weekends during bad weather. Vice-President Lynn Johnson mentioned that much of the company's processing is done overnight. Telecommuting makes it convenient for employees to monitor processing without coming into the office.

Most telecommuters are enthusiastic about the experience. "If you happen to be involved in a heavy computer project, then it is more convenient to work at home," Johnson said. It has been good for employee morale; frustrations are lessened if people can have access to their work when the weather is bad, they are ill, or they forget something at the office, she noted.

Maahs reported that IDS' part-time word processor operators "love working at home, and want the program to keep going. From an economic standpoint, it is good both for them and for us. We pay them slightly less than our regular word processing operators, but they don't have to pay for transportation, clothing and babysitting. Because of these factors, we feel we can pay them a lower wage and they are probably still coming out ahead."

Word processor operators at Continental Illinois Bank also love working at home, according to McArthur. But she noted that "the women who are working at home have a specific reason for being there — their children — and that helps keep their perspective together."

Fewer Interruptions

Rick Richardson, a partner in a Big Eight CPA firm, said he finds the 20 days a month he spends telecommuting to be very productive. "I have far fewer interruptions at home. Particularly when I'm writing, I can have absolute concentration with no interruptions. That is impossible to obtain at the office. When I'm at home I can have my secretary take all calls and I'll return them the next day."

Others like telecommuting because of the convenience. Phelps Gates, a programmer for Scientific Timesharing Corp. in Washington, D.C., lives in North Carolina and goes to the office only about once a month. "I don't want to move to Washington," he stated. "I don't have to hunt for a parking space, and I can get a lot more work done at home because people are not dropping in every now and then."

Control Data, one of the first companies to study telecommuting, has found it provides a number of corporate and social benefits. Their first program, started in 1978, was designed to train handicapped people to work at home as programmers. CDC spokeswoman Pat McKinnie said telecommuting can "reduce the high costs of maintaining disabled employees on medical leave. Everyone benefits. The disabled employees, because they feel useful and are intellectually stimulated; their families, because they witness mental and emotional improvements; and the company, because it has tapped a previously ignored human resource."

Energy Savings

Other benefits noted by CDC include energy savings because the telecommuter does not drive to work and because the need for extra office space is cut, as are heating and cooling costs. Productivity improves not only because less time is spent on transportation and more on working, but also because many find working at home desirable and are more motivated. CDC telecommuters rated themselves as between 12% and 20% more productive than previously.

Telecommuting is not without its problems. Most manufacturing and service jobs require the employee to be on the spot where the product is made or the service rendered. Many jobs that require interaction with others are also unsuited for telecommuting.

Ray Pyles is one who found his job as analyst at the Rand Corp. in California was not suited to telecommuting. "There are times when it is very

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useful to be away from the office, but that tends to be when I am trying to write something or consolidate a lot of information I already have," he said. When he is gathering information and testing and synthesizing his ideas, however, he said he finds he needs to talk to co-workers and other people who are familiar with the area. "I can't do that without some face-to-face consultation."

Business psychologist Harry Levinson, head of the Levinson Institute in Belmont, Mass., agreed with Pyles. "The essence of organizational interchange is thought, and the essence of thought is critical analysis. That can't be done by computer because the underlying assumptions are necessary before any kind of model is constructed. Once the model is constructed, you can just let it run. But the critical issue is the thinking and thinking is still going to involve a good deal of interchange among people. There is no way to run an organization mechanistically."

Another set of problems revolves around the solitary nature of telecommuting. It may be the perfect working arrangement for a hermit, but most people do need some human contact. Those who spend little or no time at their offices must learn how to deal with this issue. "I feel isolated," Gates said. "Sometimes days will go by and I won't see anyone. I miss the peer relationship and people in general."

The informal teaching that goes on in an office environment is also lost in telecommuting. "Junior staff get a certain amount of education when they work together with senior people," said Richard Raas of Anistics in Palo Alto, Calif. "That part of an office environment is pretty much invaluable."

There is some debate over whether certain types of personalities will be more successful as telecommuters. "People who can initiate and structure their own work may not need an office to go to," Levinson said, "but a lot of people can't do that. Some people need structure [and] other resources that an office provides."

Pyles claimed at least some of this is a matter of discipline. "There are times when I work at home that I am not able to concentrate, but that is because I am not able to concentrate, not because my wife is there."

Although telecommuting removes one from daily interaction with others in the work place, according to Giuliano it can actually enhance human interaction. "Teleworking involves more intensive and meaningful interactions because they are more concerned with those things that really require human interaction. Today, people spend millions of hours out of the office meeting in bars and restaurants, but interacting in the human dimension. The places where I spend the most intense time with my boss is when we are in Atlanta at a conference, or meeting with a client in Los Angeles. With technology handling routine matters, we can be more flexible in our human interactions."

At Continental Illinois Bank, the operators have established a telephone network. "If I call one operator with a special directive, by the time I call the third she will already know about it. As one woman put it, they have a comrade when they want one, but not when they don't," McArthur said.

Regardless of the type of work the telecommuter does, management is faced with new issues. How do you evaluate the performance of someone who is not in the office? How can you manage people you don't even see? James Connell, director of the Office Technology Research Group at Office Research Technology in Pasadena, Calif., distinguished two types of management. "Some managers feel that an employee has to be checked all the time or the employee will goof off. The other attitude is that a valuable employee will want to do a good job and doesn't need to have an overseer. This second philosophy has to be developed if telecommuting is to work."

Conroy, who supervises other telecommuters at CDC in a matrix organization, said he has no problem supervising people from a distance. "People have a task to do. I am not so interested in how they do it as I am in their output.

"The manager's job, as it always has been, is to orchestrate, but on a much more cooperative basis. The manager of the future becomes more of a facilitator than a manager." He singled out trust as perhaps the most important quality for a manager of telecommuters.

Maahs said IDS measures the productivity of its word processor operators by keeping log sheets. "We know if they are working by how much they send back. We cannot tell how hard they are working or whether they are being totally honest about their hours. We are taking their hours on faith."

At Continental Illinois Bank, salaries are based on production standards of a certain number of lines per day, giving those who do extra work a chance for higher pay. On the other hand, employees at Batterymarch do not get paid extra for extra hours, even though many of them put in time on nights and weekends. "If you pay people well, they are willing to do whatever is required to get the job done," Johnson said.

Time in Office

Anistics evaluates its employees on the basis of performance, but requires that they be in the office part of the time to communicate effectively with their managers.

"Managers keep time sheets and sets of project codes, as law firms do. Program developers keep track of their time on individual projects. This gives us the ability to measure the amount of time that an analyst or programmer will spend on a project. We try to establish overall tasks and approximately how long they will take to be done over the period of a year. We try to measure whether or not the objectives are met within the time period. You weigh your expectations against the time sheet, and that gives you a method of evaluating employees.

"It is not a matter of whether or not employees are always at their desks, or on time or friendly to everyone. This comes a little bit closer to an objective means of evaluating performance," Raas noted.

The legal implications of telecommuting are still unclear. In October, the Reagan administration partially lifted a 40-year ban on industrial work in the home, a move opposed by the AFL-CIO because it could lead to exploitation of wages, hours and working conditions. These issues may arise in telecommuting; as noted earlier, some companies already pay telecommuters less than office workers performing the same tasks.

Elizabeth M. Ferrarini and Gail Farrell are free-lance writers in Boston.

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Telecommuting may be perfect for a hermit, but most people do need some human contact.

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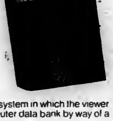

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VIDE

NEWSNET: PUBLISHING GOES ON-LINE

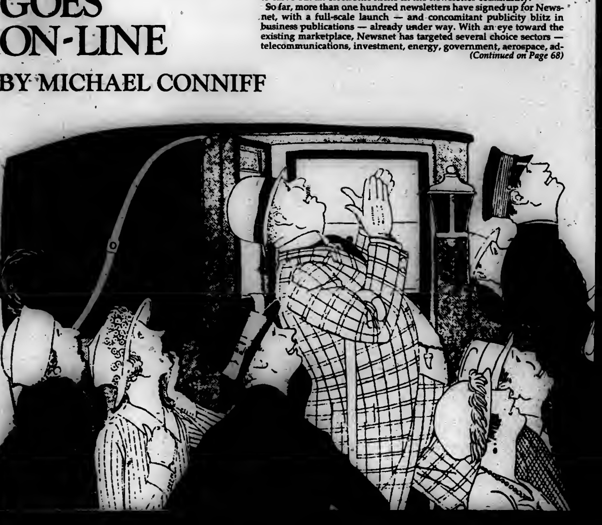
BY MICHAEL CONNIFF

As *The Philadephia Bulletin* was printing its final edition not too long ago, a company called Newsnet, a wholly owned subsidiary of Independent Publications, Inc., was putting the finishing touches on a leading-edge venture into electronic newsletter publishing.

Independent Publications is the same parent corporation that had the good sense to unload *The Bulletin* to Karl Eller and Charter Communications in 1980, while there was still a market for ailing afternoon dailies. Instead of throwing good money after bad in Philadelphia, Independent, headquartered in nearby Bryn Mawr, Pa., decided to carve out an electronic niche in the newsletter community.

So far, more than one hundred newsletters have signed up for Newsnet, with a full-scale launch — and concomitant publicity blitz in business publications — already under way. With an eye toward the existing marketplace, Newsnet has targeted several choice sectors — telecommunications, investment, energy, government, aerospace, ad-

(Continued on Page 68)



OTEX

VIEWDATA: THE INFORMATION SOCIETY

BY JAMES MARTIN

There are at least three reasons to be excited about viewdata.

First, it can bring information systems to the masses. All manner of people who would not have touched a conventional computer terminal or owned a hobby computer find themselves seduced by viewdata. It has a fascinating appeal. When they first discover that they can use it correctly, people tend to want to continue to play with it until the novelty wears off. They have overcome the psychological barrier of using a computer system.

The terminals, with mass production, should become cheap enough for most homes, like TV games. The computer terminal, instead of being something expensive and difficult to use, becomes cheap, appealing and child's play to use. Some of the people attracted to viewdata in

(Continued on Page 71)

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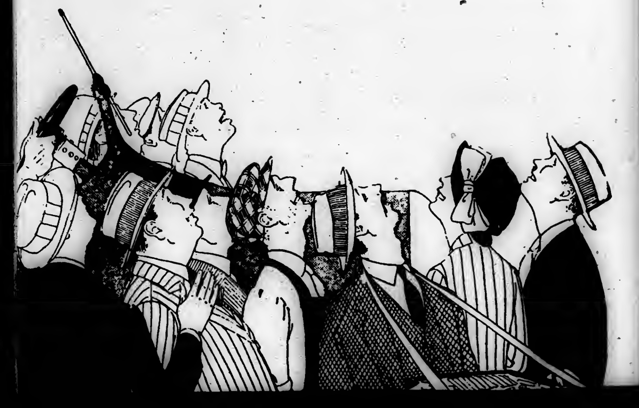


(Continued from Page 66)

vertising, and education. To even attempt such a service in this dangerous new world of unkept promises, Newsnet had to address the classic chicken-and-egg problem: how to get the right kind of terminal into the hands of Newsnet subscribers.

Fortunately Gary G. Reibsamen, then editor-in-chief of new projects for McGraw-Hill's Newsletter Publishing Center, had been busily hatching his own solutions. Newsnet'a president, John Buhsmer, recruited him as vice-president and general manager for Independent's new cause, and Reibsamen chose a small terminal called Scanset, made by Matra S.A. It rents to Newsnet subscribers for just $35 a month.

Scanset is a compact 80-column black-and-white terminal with enough user-friendliness to render obsolete any future references to the poultry world. Log-on is fully-automated because of a built-in auto-dialer, activated by pressing a single button. The Newsnet data base — with technical support supplied by Dialcom of Silver Spring, Md. — is accessed by placing a local phone call to the closest Telenet or Tymnet node.

Handling Newsnet's traffic is a Prime Computer, Inc. 750 computer at the Dialcom facility in Maryland. Basic software for the service has been leased from Dialcom also, but Cibar, a New York-based software house, will be enhancing the Dialcom software and writing original programs for Newsnet's many novel wrinkles.

Basic Functions

Once into the newsletter data base, the basic Newsnet functions are Read, Scan and Search, accomplished with three of six dedicated function keys. Subscribers are billed only when they read (not for being on line). Scan commands provide the first 24 characters of a particular item and Searches can accommodate Boolean strings and multiple terms such as "and," "or" and "not."

But these are only the basics behind Buhsmer and Reibsamen's electronic schemes. The Scanset can also support a printer, and Newsnet supplies Newsflash, an electronic news clipping service that searches the entire data base automatically, which costs subscribers $5 per month per key word searched. This capability, coupled with other Newsnet innovations, creates a whole new ball game for publishers traditionally tied to perishable print.

In effect, the combination of an automatic hard-copy printer and Newsflash creates a customized, real-time wire service for the user at a cost of $60 per hour. As soon as a newsletter is updated and a keyword activated, the Newsflash prints out in hard-copy form. Such a service will create competition among Newsnet publishers for hot buttons.

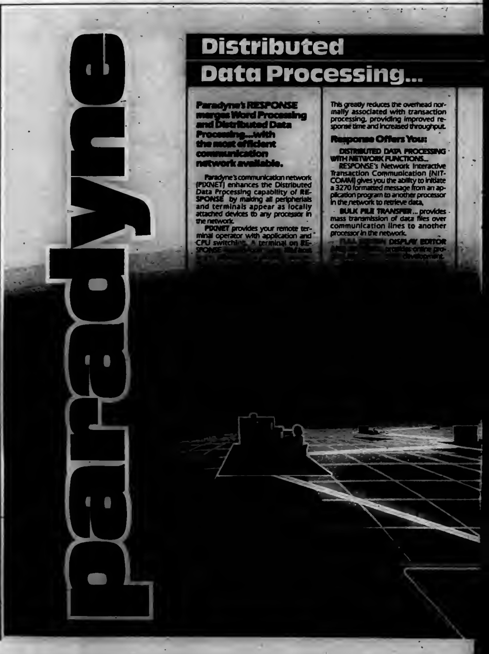
"If your competitors don't get there first, you can be sure that somebody else will. Any entrepreneur with some knowledge of the electronic possibilities and a minimal understanding of your marketplace could upstage you overnight," Newsnet has told newsletter publishers.

Newsletter publishers are beating a path to Newsnet's door. Everything from "Communications Daily" to "Caribbean Regional Report" will be up on Newsnet. Nor will newsletter publishers be tied only to the keyword search and Newsflash capability of the service. With Dialcom's support, Newsnet will provide point-to-point and point-to-multipoint electronic messaging capability. Special "Bulletins" independent of the electronic edition, are also possible, and plans for a relational data base are in the final stages.

"We believe this service to be the most versatile information product ever to be offered to the communications industry. It provides a new 'information advantage' to decision makers in every facet of communications, from telephones, to data communications, to TV, to cable," said Albert Warren, editor and publisher of "Communications Daily."

To produce such a novel product, Newsnet has relied heavily on Reibsamen'a McGraw-Hill experience and marketing expertise. "Newsletter publishers aren't quite sure what they're up against, but they are beginning to realize they had better do something. I think you'll find them better postitioned than either newspapers or magazines," he said.

This "extremely loose-knit and heterogenous industry," as Reibsamen calls it, accounts for collective circulation revenue of between $500 million and $1 billion, with a readership base of approximately 10 million. Their print product is volatile, expensive and special-



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DISTRIBUTED DATA PROCESSING WITH NETWORK FUNCTIONS...
RESPONSE's Network Interactive Transaction Communication (NITCOMM) gives you the ability to initiate a 3270 formatted message from an application program to another processor in the network to retrieve data,

BULK FILE TRANSFER ... provides mass transmission of data files over communication lines to another processor in the network.

[illegible] DISPLAY EDITOR [illegible] provides online pro- [illegible] development.

ized. Overhead is generally low — although an estimated two-thirds of all for-profit newsletters are produced by publishing companies with more than one newsletter. The entire industry thrives on spin-off operations — such as seminars, books and consulting services — and spin-offs will become the essence of competition among publishers up on Newsnet.

Furthermore, according to Reibsamen, "Successful newsletter starts have consistently doubled every decade since 1900."

However, on the undeniably negative side, newsletters are notoriously undercapitalized and lack the financial wherewithal to jump into electronic publishing. Few are automated. Without a machine-readable product, newsletter publishers are faced with yet another chicken-and-egg conundrum.

Newsnet claims to overcome those problems. There is no up-front cost. Not only is there no charge, but the publisher is actually paid for joining Newsnet. Reibsamen called the royalty package, ranging from 37% to 48%, "an offer they can't refuse."

If a publisher is without word processing capability, Newsnet will keyboard the print product into the data base and deduct the cost from the publisher's royalties.

But entrance to the world of Newsnet also means a measure of anonymity. Newsletters are listed by industry sector and assigned a code: TE01/B/D/Y represents "Communications Daily" in the pilot phase. The "TE" stands for telecommunications; the "01," for the newsletter's ID number; the "B" constitutes a $24 hourly charge for validated subscribers; "D" represents a $48 charge for nonvalidated readers (the letters represent $12 increments); and the "Y" (or an "N") denotes whether a particular newsletter wili allow headlines to be scanned by nonvalidated subscribers.

Even more challenging to the publisher, secure in his monthly printed product, is an asterisk, indicating there is new information since the user last read. No asterisk means no update — thus no reason to read. Tough on the publisher, but quite fair to the user. The upshot of Newsnet's menu is a challenging electronic facelessness for publishers. Those newsletters willing to make the painful transition from paper and ink to electronic media are likely to survive and prosper. Newsnet's innovations — immediate access to subscribers through electronic mail, Newsflash's automatic clipping and wire service, the option of hard copy and the bulletin and (eventually) relational data base capability bring forth the full promise and purpose for which newsletters were created.

Publisher Migration

Will newsletter publishers rise to the new opportunities offered by Newsnet? "That's up to them," Reibsamen said.

So far, the record for print publishers migrating toward the electronic medium has been disappointing. Most of the newspapers up on Compuserve, for example, have been content to merely interface their standard print product with the on-line delivery vehicle. With a few exceptions, the result for the 11 Compuserve newspapers has constituted a lesson in how not to approach electronic publishing. At this stage in the evolution of on-line data bases, it is not sufficient simply to display the print product on a cathode-ray tube.

Newsnet, on the other hand, is convinced they have tapped into an innovative portion of the publishing world. In the trial phase, more than 40 subscribers have been accessing the data base at least once daily, and many use it even more frequently. In Buhsmer's words, there has been "very little negativism" from the newsletter publishers.

The positive momentum generated by Newsnet could not prevent a tinge of sadness when *The Philadephia Bulletin* stopped presses after 134 years. Colleagues in Bryn Mawr felt helpless as they watched old compatriots forced out of work.

But the future belongs to the innovators, and Independent Publications is moving quickly while other communications conglomerates twiddle their corporate thumbs. Given the complexity of most on-line data bases, Buhsmer and Reibsamen may one day be able to say, "In the on-line world, nearly everyone reads Newsnet." It's all a long way from Philadelphia.

Michael Conniff is manager of the Videotex Planning Service and Database Development at Link Resources in New York. ◆

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The long-term goal is to provide Videodial software and hardware.

Videotex Goes to Work

Metropolitan Life Insurance Co. is on the verge of becoming the first major insurance house in the U.S. to utilize videotex technology. It is just concluding a six-month test in-house of Videodial videotex technology that has reached an estimated 100 managers and company officers.

Both black-and-white and color terminals have been used to display two vendor types of prototype applications. One is the management information-type service typically put together for private system demos. The second prototype is for sales representatives in the field with a portable terminal.

Videodial is a wholly owned subsidiary of the French systems house, Telesystemes.

Telesystemes has been instrumental in setting up videotex-format service bureaus on the Continent (Videotel and Eurodial) as well as developing intelligent concentrators for X.25 and switched telecommunications lines.

Bureau service for customer experimentation and development will be operated by Videodial using the DTSS Honeywell, Inc. DPS computer. Videodial personnel, all recruited in the U.S. and trained in France on the Telesystemes software, will provide training and software support.

What Videodial brings to the arrangement that has been missing from previous approaches is its TS'X intelligent concentrator. It can accommodate the standard French videotex equipment carrying the 1,200/75 bit/sec inboard modems. TS'X can also interface to packet-switched networks demanding 1,200/1,200 bit/sec communications.

The long-term goal is to have customers bring the Videodial software and communications hardware into their companies. While front-end minicomputer-based configurations are possible, Videodial's designers feel that for optimal use of the systems features, a mainframe approach is necessary.

System Features

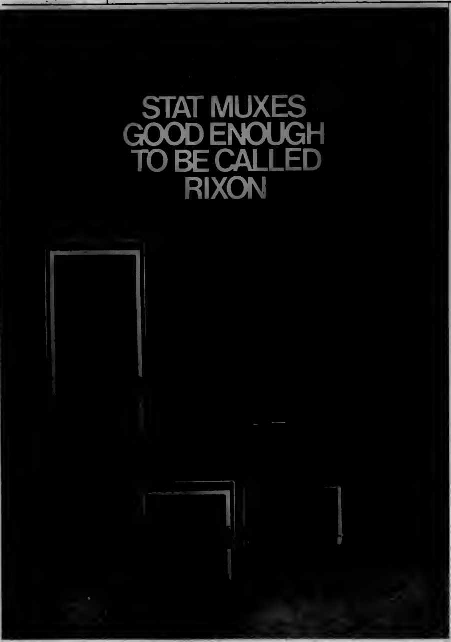
Features include the ability to provide "execution programs" in Videodial's words, or to work with existing customer applications programs through videotex terminals in conventional data processing nomenclature.

If a customer wants special types of graphics presentations for volatile data instead of numbers and text, this can be accomplished in real-time interactive fashion. Another impressive feature is the ability to edit on screen from a user terminal on a character-by-character basis without creating a substitute page.

Whether Videodial can succeed where others did not, and whether U.S. corporations are willing even to consider the concept of in-house private systems will be a major question for 1982. Right now, Videodial is based in a New York office at Columbus Circle which also houses a Matra S.A. representative.

While Videodial's formal position is that it is not a terminal supplier and will only coordinate the selection of terminal equipment to work with its system, insiders detect signs that Matra has a favored status. Since the announcement that the first interactive Antiope service for the public (First Bank Systems in Minnesota) will go with TRT, the ability of Tymshare to supply Matra products to the U.S. market is still unproven.

This story was excerpted from the Viewdata/Videotex Report, *© 1981 Link Resource Corp., New York, N.Y. Link Resources is a firm specializing in a variety of video-related technologies and services and provides information through newsletters and their Continuous Information Services.‡* ◆



homes will find it useful in their business.

A conventional forecast for the number of computer terminals in a technically advanced country by 1985, at the time of writing, is about 2% of the population (for instance, 4.5 million conventional terminals in the U.S.). If viewdata sells like TV games or CB radio, the number of terminals could be 10% of the population. Eventually there may be as many terminals as telephones. Viewdata sets may, for example, replace telephone directories. It would be cheaper to give subscribers free viewdata equipment than to distribute telephone directories each year if the viewdata equipment could be mass produced for the cost of TV games.

The second reason to be enthusiastic is that the viewdata dialogue is so appealing. Most computer terminal dialogues have been appropriate for computer enthusiasts to use, but not for the average citizen. Computer programmers tend to create dialogs that are more appropriate for other computer programmers. Now we have the editors of glossy magazines creating terminal dialogues. They pay a great deal of attention to making the screen as attractive and easy to use as possible. They use the graphics characters and colors to the best effect. When the public becomes used to viewdata, there will be more pressure on programmers to create dialogues which are attractive and psychologically effective.

Third, viewdata, along with other information utilities, is the beginning of a chain reaction. The data networks will spread until they interconnect most towns in the industrial world. The information banks will grow furiously with different organizations everywhere creating different types of data and programs. The vast libraries of data and programs will be accessible from home and office.

The information society will bring the capabilities of computers to everyone. Children not yet at school today play with the viewdata sets. They will grow up with computing, do their homework with it, learn of the vast sources of information at their call. When they learn algebra, they will learn that machines solve equations. When they learn calculus, they will learn that machines integrate and differentiate. When they learn engineering, their homework for one night might be to design a suspension bridge or space station with the machines doing the work.

Creative people will use their screens to help them invent, write poetry, comprehend, explore, create new companies, plan their leisure. The information society can abolish most drudgery, leaving people free to think, challenging them to create.

The population of the world will double again in the next 40 years. An increasing part of it will grow up with access to the information fabric. There will be more creation of music, more invention, more literature. A higher proportion will work on creating films, television, automated training and add to the vast electronic warehouses of information and entertainment. Forty years from now, this turbulent planet may have a hundred times as much creativity as it does today.

Viewdata has a vast number of applications. To ask how it will be used is almost like asking Gutenberg how printing would be used. He would have said printing had several possible applications, but would have been unable to think of most of those that eventually developed.

One of the most attractive features of viewdata is its potential appeal to the entrepreneur. You do not have to be a giant organization to be an information provider. Some of the information providers are one-person operations. Computer hobbyists or individual entrepreneurs can, in principle, put data or programs into the viewdata files. Each time viewers use the data the information provider will be paid a small royalty. Unlike many forms of publishing, the private individual ought to be able to participate.

There were certain pubs in London where, during the Prestel market trial, a major topic of conversation was "How could we make a fortune from viewdata?" The proposed answers were not always the most socially desirable. They included gambling schemes, bingo, one-armed bandits, income tax minimization, the joke of the day, interactive computer dating and backing horses after seeing them on television before a race.

Hundreds of topics are now available on Prestel and the list is rapidly growing. Most come from large information providers, although a few small or one-person information providers exist. Viewdata will attract the small entrepreneur only when it has a large number of subscribers. Its appeal to the hobbyist could be considerable.

About 200,000 pages were allocated to the applications. Any one information provider was restricted to 10,000 pages in order to preserve variety on the initial system. This was an artificial restriction and many applications needed far more pages if they were to be complete.

Many of the data bases were experimental rather than complete. For example, one could search for a house; but only in certain towns and only in certain price brackets. To handle the application completely, hundreds of millions of pages would probably be needed. This raises questions about the size and growth rate of viewdata systems.

Both residential and business users have expressed great annoyance about the incompleteness of the data. They found it frustrating to start a search only to find that what they needed was not in the data base. People resent paying a few pennies for a fruitless search.

The attractiveness of viewdata to consumers depends on the diversity of data. If it makes a vast range of information available in the living room, consumers are more likely to pay the cost of the service.

Industries Affected

Certain industries will be directly affected by viewdata. For some, it presents an opportunity to expand their marketing or create new services. For others, it could represent a threat in the long run when viewdata (or similar) terminals become widespread.

Any industry which provides information or paperwork services to the public could be affected. These include:

- Newspapers.
- Publishing.
- Employment agencies.
- Travel agencies.
- Real estate agencies.
- Other type of agencies.
- The travel industry.
- Banks.
- Credit and financial institutions.
- Advertising.
- Mail order and other direct selling.
- Education.
- Market research.
- Time-sharing and the data bank industry.
- Shops making special offers.
- Mail services.
- Advice bureaus.

Many firms of the above types have become information providers to the existing viewdata services. In addition to the above, all firms may be concerned as users of viewdata. In some cases, they will use public information; in some cases, information for closed user groups. Some firms have established private in-house viewdata facilities for their own internal data.

Business Applications

The most notable prediction put forward by many (but by no means all) information providers was that the business market for Prestel would take off first — indeed, that it was ready to take off immediately if only terminals and facilities were available.

Business use of Prestel overcomes two of the major drawbacks to the service, namely cost of use and need for special equipment in the home. If business users feel that Prestel (or, more accuretely, one or a few services available through Prestel) is worthwhile, they will use it. Small, self-contained applications are likely to be of immediate use to certain specialized businesses, which might disregard the rest of the available services.

On the other hand, business users are unlikely to be tolerant of faults, delays or other system problems; nor are they likely to be willing to line up for a port into the system. They are likely to consider the use of alternative or competing systems to Prestel.

Use For Information Retrieval

Information retrieval is the first of the four categories of viewdata service and the service receiving the most attention. Business interest is already emerging as a result of viewdata's potential for information retrieval, combined with its features of relatively low cost and easy use. Business faces a rapidly growing need for information and particularly for low-cost terminals available to a wider range of nonspecialist business users than now — in places like the front office and managers' and secretaries' desks.

But already businesses make use of a variety of information retrieval

Business is interested in viewdata's information retrieval potential, which is low in cost and easy to use.

Viewdata can leave simple messages when recipients are unobtainable by telephone.

aids, primarily printed material, the telephone and conventional computer systems. Compared with these, viewdata promises simple low-cost access (an advantage over conventional computer terminals) to information which is up to date (an advantage over print) and which should be continually available (an advantage over the telephone). But it will compare less well in terms of cost with printed matter and the telephone and less well in terms of capacity for detail in most cases with all three.

Businesses will find that viewdata is not directly comparable with any of its existing information retrieval services. Rather, viewdata will find a place of its own. Applications will emerge for which it is well suited, where its advantages are valuable and its shortcomings are not critical:

- Access to general business information available on public viewdata services, such as air and train timetables, government statistics, export information, business news and share price information.
- Access to highly specific business information, where there is a need for a limited measure of security, on a closed user group basis offered either as part of a public service or as a private service. Examples include commodity prices, fare prices and seat availability for travel agents, drug information for doctors and legal records for lawyers.
- Access to private business information through an in-house viewdata service where improved security and better economics are important. Examples include general company information of the sort printed in newsletters, appointments, job vacancies, sales and production performance, product data and current price lists. Also included is information specific to particular groups of users in a company, such as stock information, detailed specifications and financial control data.

Use for Computation

Viewdata's computation service will offer business users the possibility of computing answers to problems through their terminals. Problem-solving programs stored at the viewdata centers will be able to process parameters entered at the terminals — such as in an income tax calculation.

Conceptually, using viewdata for computation is like using a remote terminal to access a computer time-sharing service bureau. In practice, the key difference is that the viewdata computer will be unable to perform sophisticated computations; to do so would require processing power and storage which would jeopardize the economics of information retrieval. Time-sharing service bureaus typically are used for applications such as stress analysis, financial and econometric modeling, linear programming, regression analysis and rates of return on investment. They are used by R & D departments, corporate planning, accounts, data processing and operations research. Terminal operation is skilled and, compared with viewdata, traditional time-sharing services are expensive.

Computation through viewdata will find a niche between hand-held and desktop calculators and time-sharing service bureaus. Applications will include payroll, tax and accounting routines. Other applications will be designed to fit with viewdata information retrieval. Thus business users might retrieve the current rates of exchange and commodity prices to perform calculations on investment returns in the commodity market.

Use For Message Services

Like information retrieval, the business need for person-to-person communication is growing rapidly — both internally between offices, departments and divisions and externally between different organizations. To help meet this need, a range of services is on offer or under development, including telex, teletex (the proposed international standard for communicating word processors), facsimile and telephone services including recording services and voice store and forward. Is there a place here for viewdata?

The answer lies in viewdata's simplicity and availability when terminals are in widespread use. Although it offers no text composition aids and its communicating speed (at present) is relatively low, its message service capability will appeal to business users — for example, for leaving simple messages with one or more recipients when they are unobtainable on the telephone. The messages could be preformatted and customized or created specially. Typical applications will include messages about meetings, delays, schedule changes and requests for information and action. For example, to contact salespeople in the field, a sales director could leave messages for them, as they were previously instructed to check the messages in the system at

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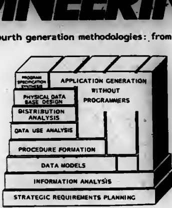
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particular times of the day. Another use for the message service will be in ordering goods and services from information providers — for example, hotel and travel reservations.

A telex network interface would appeal to businesses without a telex terminal or where the telex terminal is remote from the message originator. Although technically feasible (a viewdata/telex link has been demonstrated with Prestel in Britain and also between Britain and Switzerland), the development of such an interface is not certain — it will depend on the policies of the Public Telephone and Telegraph companies and their perception of the relationship between viewdata for messages and more sophisticated telex and facsimile service developments.

If a viewdata/telex interface were offered, the bridging would be done at public service viewdata centers. Users of terminals accessing private or in-house systems would be able to dial their public service viewdata center to connect to the telex service.

Use for Software Distribution

Software distribution is the fourth category of viewdata service. Although strictly a type of information retrieval, the distinction is justified because of the difference between information, which is comprehensible to readers, and software, which is comprehensible to computers.

The purpose of software distributed through viewdata is to permit the remote loading of programs down-line from a viewdata center to intelligent terminals or small computers able to use the programs for local processing. Software distribution will be through public networks as well as closed user groups or private operations specializing in this application area.

A prerequisite is that the programs should be portable and able to run on a range of popular devices. Although these aims are not easy to achieve in practice, versions of Cobol and Basic have both been down-line loaded by telesoftware. Software providers will be able to charge for their services in the same way as information providers. But because the software is designed to be stored, it will generally be distributed on a rental basis. Software providers can arrange to build time lockout logic into their programs, ensuring that they are disabled (so unimplementable) a preset period after their distribution.

The main alternative to distributing software by viewdata will continue to be the physical distribution of recordings on media such as tape cassette, floppy disc and plug-in solid-state read-only memories. Viewdata will offer the advantage of more rapid distribution, which need not be more expensive.

The types of application programs likely to prove attractive to recipients of viewdata-distributed software will include financial routines such as taxation, purchase/sales ledger, payroll and VAT; inventory control applications such as stock recording, stock classification and replenishment control; and modeling programs.

Besides physical distribution, another alternative to software distribution through viewdata is broadcast software, which has also already been demonstrated.

Penetration Into Business

Although it was designed with the residential market in mind, viewdata's initial penetration will probably be in the business marketplace. The reasons are clear. The need for timely, accurate information is more obvious and more urgent and the market is less price-sensitive. The factors which will encourage viewdata's use in the business marketplace include:

- Its simplicity (no operating instructions, no training) and its use of terminals which are convivial, attractive and nonthreatening.
- Its low cost.
- The opportunity to access different systems through a single terminal — public, closed user group and private in-house.
- The relative ease with which services can be implemented; not only standard terminals, but complete systems for in-house operation are now becoming available.
- The ability to provide more than one type of service on a single system — information retrieval, computation, message services and software distribution.

But there will also be factors counting against it:

- Its limited capabilities.
- The relative lack of security inherent in a public system.
- The availability of specialized and more sophisticated alternatives.

Despite these obstacles, the benefits of viewdata will justify its adoption by a number of different businesses. Probably closed user group and private in-house services will penetrate at first more rapidly than public services. Compared with public services

Viewdata's initial penetration will probably be in the business market.

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There will be a strong convergence between viewdata terminals and personal computers.

they will offer several advantages:

- Independence.
- Improved security.
- Superior economics, particularly for intensive users.
- The opportunity for custom developments, for example, of messages services.
- The possibility of providing access to existing data bases — such as in-house data bases — not accessible through the public network.

The development of public viewdata services will provide the impetus for private and in-house services, both from the publicity which will surround the public services and from the experience and the terminal production economics which will be gained. The businesses to which viewdata will appeal will be both large and small. Large businesses will use it for retrieving general information and for internal staff communications, where it will complement existing computer services. Small businesses will use it, often as the only terminal system, for information retrieval and increasingly for software retrieval.

Greater Sophistication

But following viewdata's acceptance in the business community, there will be a strong and evident trend to provide terminals with greater capability and sophistication. These advances will permit an extended range of functions and will be achieved at relatively small price increases. Viewdata terminals will gain alphanumeric keyboards, internal processing power and storage for off-line operation. They will be able to retrieve large numbers of frames into local storage for local processing, manipulation and calculation. For example, for a railway timetable inquiry, an intelligent viewdata terminal could provide a direct answer to a question such as the time of the first train on Saturday between towns A and B.

There will be a strong convergence between viewdata terminals and personal computers. An increasing proportion of personal computers will be fitted with modems to permit them to access remote data bases.

Some viewdata sets will be put in public places such as libraries and schools. Some such sets will be coin-operated; others will be similar to regular business or residential sets.

Pay terminals will generally be able to access the complete public data base in a public videotex service. They could be positioned in places similar to where normal pay phones are located.

They will be able to accept coins or tokens and probably credit cards as well in countries which make wide use of them. To protect against damage and vandalism, they will be solidly built like pay phones, probably with screens protected by heavy-duty glass. Both monochrome and color pay terminals will be available.

Free terminals will be placed primarily for advertising. They will permit access only to limited parts of a public data base or to private data bases established specifically for the purpose. They will be found in locations like airport waiting rooms, hotel rooms and department stores. Their purpose will be to provide promotional information about goods and services in the area, such as hotel locations and rates, flight timetables, price lists, special offers and local events. In other locations, such as schools, universities, employment centers and libraries, they will be used to provide information such as career guidance, educational courses, employment opportunities, citizen advice and welfare services and benefits.

Who provides the information for viewdata systems?

The answer to this is one of the most appealing aspects of the scheme. Anyone can provide it.

The information providers on the early viewdata systems range from giant corporations to one-person organizations. Typically, they pay a fee to rent space on the viewdata system and place information or programs there which they think will interest the public or businessmen. Whenever their pages are accessed by viewdata users, the information providers are usually paid a small fee — one or two cents, for example. The cents mount up and they hope to make a profit. If a large number of users access their data, the profit could be huge. On the other hand, if they reserve a large number of frames and these are rarely used, they will suffer a loss. Viewdata has a characteristic in common with much of the publishing and entertainment industry: Most published material does not make much money, but the ones that hit the jackpot make a fortune.

What information or programs do you think would make money on viewdata?

James Martin has authored numerous books and teaches seminars in computer topics worldwide. ‡

◆

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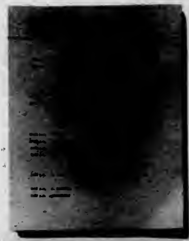

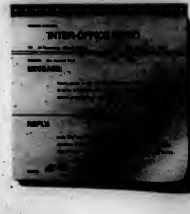

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TELECOMMUNICATIONS IN A LESS REGULATED ENVIRONMENT

Technologically, the future of data communications has never been brighter. Data communications manufacturers, the companies that make the multiplexers, data concentrators, modems and network control systems used to build and manage computer communications networks are a part of the information industry — an industry with enormous potential for growth.

Developments in components technology — new transmission media, higher and higher transmission speeds, more and more complex and varied networking systems — are opening up new market areas.

But the data communications industry has never existed in a vacuum. It is surrounded by a regulatory atmosphere that has always had a vast influence on its structure and direction — and this atmosphere is changing. In this article, I shall review briefly the basic regulatory and legislative events that will make the 1980s a different market in which to do business and examine the opportunities available to independent data communications companies within the new regulatory environment.

In the U.S., the Carterfone decision of 1969, which made it possible for customer-owned equipment to be connected to telephone lines, virtually gave independent data communications companies a license to go into business. For 12 years, we have

By Charles P. Johnson

Congress has been trying to rewrite the 1934 Federal Communications Act.

had regulation that was unequally applied. For 12 years, interconnection has been a reality in the U.S.; now deregulation is becoming a reality. The Federal Communications Commission (FCC), in its Second Computer Inquiry, the final decision of which was handed down on April 7, 1980, called for the deregulation of all customer-premise equipment and a whole range of what are called "enhanced" services.

Customer-premises equipment includes data communications equipment. Although not clearly defined, enhanced services are taken to mean anything that is not basic one-to-one transmission. In very simple terms, the FCC sees data transmission as a pipeline — if you get out of the pipe what you put into the pipe, that is *basic* communications; anything that alters input or output is enhanced.

Under the decision, telephone companies, including AT&T, are permitted to offer products and services on a deregulated basis. However — and this is important — AT&T must set up a separate subsidiary to market such equipment. This "fully separate company" under the FCC decision, is purely a marketing and distribution entity.

AT&T's Western Electric Co. would be the manufacturing arm for both regulated and deregulated areas and Bell Laboratories, Inc. would do research and development for both. The marketing subsidiary — and this is also an important point — is prohibited from owning transmission facilities.

March 1, 1982 was the original deadline for creation of this entity, which has been christened "Baby Bell." On Oct. 7, the FCC extended that date to Jan. 1, 1983. Bell, however, has proceeded as though deregulation were already a reality and has begun a massive restructuring, dividing the company along regulated/deregulated lines.

Baby Bell, it is estimated, will, if it is ever allowed to be born, have assets of $19 billion, revenues of $8 billion, 130,000 employees and a sales force of 15,000.

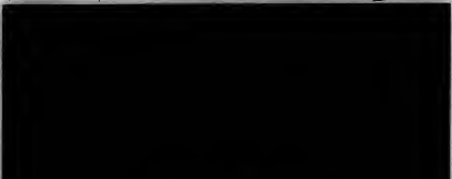
The FCC decision requires that the independent telephone companies also offer enhanced services and customer premises equipment on a deregulated basis. In anticipation or response to this, some independents have established separate direct-selling organizations. Rochester Telephone's Rotelcom Data is one of the most successful of these. The largest independent, General Telephone, has not yet fully implemented a new marketing organization to address the deregulated market. A customer premises equipment group has been established at headquarters, but a field sales force is not yet in place.

S. 898

Meanwhile, Congress has been trying to rewrite the 1934 Federal Communications Act. The latest attempt at this is the Telecommunications Competition and Deregulation Act of 1981 (S. 898), whose main sponsor is Sen. Robert Packwood (R-Ore.), chairman of the Senate Commerce Committee. The Packwood bill, with some significant amendments initiated by Sen. Strom Thurmond (D-S.C.), chairman of the Judiciary Committee, was approved by the Senate by a vote of 90 to 4 on Oct. 7.

The Packwood bill takes deregulation one step further. Like the FCC's Computer Inquiry II, it also would deregulate customer premises equipment and enhanced services. Unlike the FCC ruling, the bill requires AT&T to set up a "fully separated affiliate" to perform not only marketing, but also research, development and manufacturing functions in support of these unregulated activities. The Packwood bill does not bar the affiliate from transmission facility ownership and further allows it to lease such facilities to the AT&T operating companies.

The legislative focus will now turn to the lower House, where the Telecommunications Subcommittee, under the leadership of Rep. Tim E. Wirth (D-Colo.) is preparing its own version of telecommunications legislation. Wirth has been particularly outspoken in his con-



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cern about deregulating before effective competition exists in the various sectors of the telecommunications industry.

The Department of Justice decided to reach an out-of-court settlement with AT&T on Jan. 8, 1982. Most observers feel the Justice Department won its case, since Bell must divest itself of its 22 operating companies in exchange for a "modification of final judgment" of the 1956 Consent Decree forbidding AT&T from offering unregulated communications products and services.

The net effect is that AT&T is no longer a telephone company, but is yet another firm with interests in a variety of communications and information services, free to compete on the open market.

This, then is the domestic regulatory/legislative picture as it now stands. There is no certainty that this is the final picture. Congress has been considering various forms of telecommunications legislation since 1976, when AT&T was successful in getting a bill called the Consumer Communications Reform Act introduced. Present legislative proposals have a long way to go before they become law. The House bill is being handled by the Telecommunications Subcommittee. There is no way of predicting at this time what the final legislation will actually look like or even when we will see it.

Present legislative proposals have a very long way to go before they become law.

The FCC decisions under Computer Inquiry II are also under appeal in the federal courts. Several issues have been raised, ranging from an allegation that the FCC does not have the authority to make such a decision, to claims that the separation procedures in the decision are not sufficient to ensure fair competition in the marketplace. With the delay of the implementation date from March 1, 1982 to Jan. 1, 1983, the pressure is off the courts to make a decision on this case, and it is unlikely that any rulings will be issued in less than six months from now.

Implications of S. 898

Given this uncertainty, I would like to take the legislation as it now stands (S. 898) and briefly review its implications.

Independent data communications manufacturers previously sold their equipment either directly or through a distributor to business systems customers. Some manufacturers also sold equipment to independent telephone companies, which offered it on a tariffed basis to their customers.

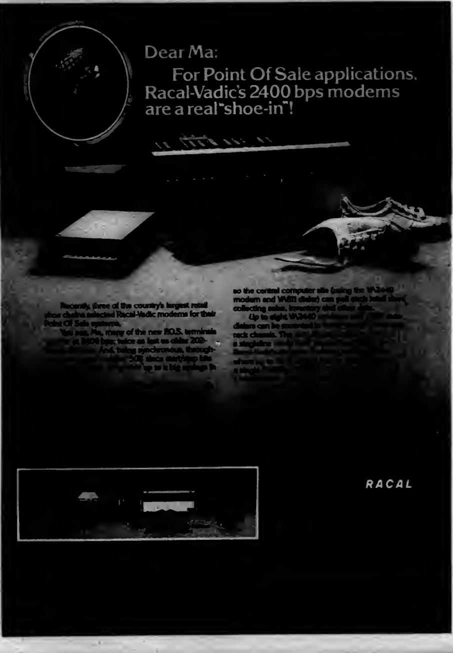
Now, if new legislation is passed unaltered, customer premises equipment, including data communications equipment, will be deregulated and can no longer be offered by telephone companies under tariff.

Such equipment can then be sold (or leased/rented) directly only to the business systems user, either by an independent data communications company as before or by two new direct-sale market elements — the fully separate affiliate and the independent telephone companies. The data communications manufacturers will therefore be operating in a market with both AT&T and the independents as competitors — or they may well become their suppliers.

Another important change is that telephone companies will no longer be subject to geographical territory limitations for their unregulated activities. The independent telephone companies can sell in Bell's territory and Bell in theirs.

As mentioned earlier, many independent telephone companies have responded to this by establishing direct-sale organizations, even though they are not required to do so under the provisions of the FCC Computer II decisions or the Packwood bill.

The less regulated marketplace of the 1980s will certainly be a much different place in which to operate. The emerging market structure, however, still offers many exciting opportunities. Many of these opportunities are products of the already existing technological and marketing trends in data communications. Others will actually be fostered by in-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Recently, three of the country's largest retail shoe chains selected Racal-Vadic modems for their Point Of Sale systems.

You see, Ma, many of the new P.O.S. terminals [illegible] at 2400 bps; twice as fast as older 202- [illegible]. And, being synchronous, through- [illegible] 30% since start/stop bits [illegible] up to a big savings in [illegible]

so the central computer site (using the VA2440 modem and VA811 dialer) can poll each retail store, collecting sales, inventory and other data.

Up to eight VA2440 [illegible] auto dialers can be mounted in [illegible] rack chassis. The [illegible] a singleline [illegible] Racal-Vadic's [illegible] where up to [illegible] a single [illegible]

Deregulation should help encourage a large number and variety of new network suppliers.

creased competition. We can divide the 1980s marketplace into two main areas of opportunity: The network equipment market and the customer-premises equipment market.

Before we consider these two market areas, I think we need to step back a pace and examine what I believe will be several important characteristics of the 1980s data communications marketplace.

First, it will continue to be a high-growth market, naturally linked to the growth in the information industry. In the 1980s, this market should grow at the annual rate of 25%, so that by 1990, data communications equipment sales should reach approximately $5 billion.

Second, it will be a highly cost-driven and economically sensitive market. Because of the economic pressures of inflation and high interest rates, the 1980s customer will, more than ever before, be a cost-conscious customer looking for the best buy for his money.

Third, it will also be a market where there is a wide variety of choice — both in the equipment itself and in the networking applications available. Customers will have a choice of many different kinds of networks using a wide variety of equipment.

They will also have a choice of many different kinds of transmission media; microwave, satellite, fiber optics and digital transmission are all possibilities and will all be used extensively, and sometimes in combination — in the data communications networks of the 1980s.

Finally, there is a trend toward what we can call integration, toward the linking together of bigger and bigger communications chains.

During the past decade, data communications networks have increased in size and the number of approaches available to fill a given networking need has increased. Deregulation did not bring about this increase, but the deregulated environment we are about to enter will encourage a greater number and variety of suppliers to enter the networking business.

Equipment Connection

The area, of course, which deregulation has affected directly is the connection of terminal equipment to the lines. Before, a customer could obtain lines and equipment from a single vendor. Now all equipment is deregulated. In areas served by Bell System operating companies, a customer must contact at least two vendors to provide his necessary lines and equipment.

This will give customers more incentive to plan their equipment purchases carefully and will lead to more effective local and national networks. Also, the independent telephone companies, which are withdrawing from the Bell System as concurring carriers and which, under deregulation, no longer have franchise restrictions, can also join together and build their own networks.

On the other hand, the "do-it-yourselfer," the private network builder — deregulation or not — will continue to become an increasing force in the marketplace.

There are already many alternatives to the use of the switched network in building communications systems both on a local and a national level. More and more private companies are becoming aware of the new networking alternatives. Many of them may want to build their own networks, especially if the cost of using telephone lines increases.

These networks will range from short-haul local-area networks — wthin an office building, for example (Xerox Corp.'s Ethernet is a prime example of this) — to private national networks.

As a local extension of this, some larger companies will decide to offer the use of their large private networks to others.

Shell Oil Co. and International Harvester Co., for example, have announced plans to do just that. Existing resale carriers that offer communications packages to the customer are, under the new rules, deregulated. This will give these carriers new freedom to expand their of-

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ferings and will encourage new resale carriers to enter the marketplace. Specialized carriers offering unique solutions to networking problems will also be attracted to the marketplace.

The emergence of the voice/data PABXs combines both voice and data within the "office of the future" environment. Networks using voice/data PABXs are capable of acting as the "gateway" to national networks.

The PABX in these systems is used as the office controller to interface incompatible terminal devices. Contenders in this field currently include Datapoint Corp., Exxon Communications and Rolm Corp.

Customer for '80s

In the 1980s, then, a certain kind of customer will begin to dominate the network equipment marketplace. He will be a customer who is looking for innovative, flexible equipment, equipment that can be tailored to fit a specific communications need.

He will be looking for an integrated systems solution to that need and will need the diagnostic equipment to manage and control his network. The basic building block of many of these networks will still, of course, be modems and multiplexers. The worldwide market for multiplexers is expected to increase.

Since 1978, transmission rates have been increasing and business users have been improving their networks by substituting medium- and high-speed modems for low-speed modems. The five-year outlook from 1980 to 1985 shows 300 bit/sec modems used in the traditional corporate data communications environment decelerating in growth from $15 million in 1980 to $11 million in 1985 — or a decline of 9% compounded annually.

The 300 bit/sec modem is being displaced by the full-duplex 1,200 bit/sec modem which provides the user with a transmission speed four-times greater without having to change any host-related software or hardware.

However, a new and significant portion of the modem market, the market for a low-cost 300 bit/sec modem aimed at the small business systems user, will cause a net increase in the number of 300 bit/sec modems supplied. The desktop computer market is expected to reach one million units a year and if only 30% of them have a communications requirement that will mean 300,000 modems per year.

The market for 2,400 bit/sec modems will grow in dollars at a slower rate because it does not have the applications potential of the 1,200 bit/sec full-duplex modem in two-wire lines. The five-year forecast for 1,200 bit/sec is expected to grow from $80 million in 1980 to $160 million in 1985. During the same period, 2,400 bit/sec modems will grow from $93 million in 1980 to $236 million in 1985.

As more business systems users begin to expand their networks, the trend to even higher speeds will continue. Also, advances in microprocessor technology coupled with improved network diagnostics have eliminated the higher error rates that plagued high-speed modems in the past.

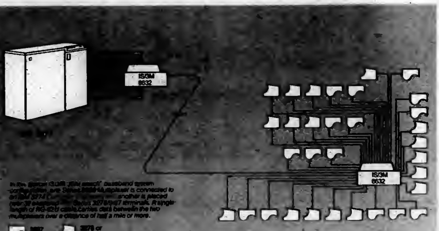
The highest speed modem currently available is 16K bit/sec, although 4,800 and 9,600 bit/sec modems are more commonly in use. The long-term outlook for 4,800 and 9,600 bit/sec modems indicates a five-year compound growth rate of 25% between 1980 and 1985.

Shipments for 4,800 bit/sec modems will grow from $140 million to $331 million, while 9,600 bit/sec modems will grow from $157 million to $404 million during this same time period.

With the move toward distributed processing and local-area networking, a new growth opportunity has arisen — local-area distribution using baseband modems. A local-area network may be within an office or other business facility or between two nearby central offices.

The range of the local-area modem used in this network is usually about 10 miles. Its speed varies from 300 bit/sec

The full-duplex modem will provide fast transmission without a change in software or hardware.



In this typical IS/3M "IBM attach" baseband system configuration, one Series 6600 Multiplexer is connected to an IBM 3274 [illegible] another is placed near 32 clustered [illegible] Series 3278/3287 terminals. A single length of RG-62/U cable carries data between the two multiplexers over a distance of half a mile or more.

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The method: time-division multiplexing.

IS/3M's new Series 6600 "IBM attach" uses time-division multiplexing (TDM) to squeeze more data channels onto a standard baseband cable. Installation is quite simple. One or more IS/3M Series 6600 head-end multiplexers is attached to the controller. Depending on the model selected, a single MUX can handle data for up to 4, 8, or 32 ports.

Series 6600 Multiplexer available with 4, 8, or 32 input/output ports.

The multiplexed data streams are carried via the existing RG-62/U cable to an identical Series 6600 MUX at the remote location. Local baseband cables connect this multiplexer to its assigned terminals and printers.

Flexibility, plus uncompromised system performance.

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The '80s should see an increased need for more sophisticated network management equipment.

to the megabit range.

The 1980 market for baseband products was estimated at $40 million as compared with $19 million in 1978 and this market is expected to grow at a rate of at least 35% through 1985.

With the growth of networks will come the demand not only for multiplexers, but also for more and more sophisticated network management equipment. Customers in the 1980s will demand not only network diagnostics and control to be supplied by this equipment, but also data that will enable them on a long-term basis to more efficiently manage their networks.

Right now, there are only a few manufacturers that have successfully met the needs of customers for network management both from a software and a hardware approach. The 1980s should see an increased need for such services.

In our second market category, the customer premises equipment market, the 1980s will also afford many exciting opportunities. Most of these will center around the penetration of the computer into more and more areas of modern life. Information access, transmission, storage and retrieval through the combined use of terminals, data communications equipment and microcomputers is fast becoming a reality.

Recognizing the potential of this market, retailers such as Sears and Roebucks, J.C. Penney and Montgomery Ward all have plans to set up distribution outlets. After deregulation, the 1,500 Bell Phone Centers will also be in the business.

For the data communications manufacturer, this market is an ideal vehicle for the so-called "modem on a chip" and for other inexpensive modem forms. Low-cost terminals and computers will require low-cost modems. The so-called modem chips available from semiconductor houses are not full modems.

Data communications manufacturers are the logical candidates to develop a full modem-on-a-chip because they possess the knowledge of all the requirements of a modem and can implement that knowledge in large-scale integration.

The desktop computer market will certainly require a low-cost modem as an accessory item even though, in general, the low-speed modem market is declining. The home information services and the desktop computer market represent particular areas of high potential for the data communications manufacturer of the 1980s.

Summary

Let me summarize now the new regulatory environment we all will be facing in the 1980s. In the U.S., interconnection, followed in little over a decade by deregulation, will create an even more competitive environment than before. Independent data communications manufacturers are hoping this competition will be fair.

In the rest of the world, Canada and the UK are the only countries now headed toward more liberalized interconnection. There will, however, continue to be an international market on a license basis for data communications technology, which independent manufacturers are in the best position to supply.

The market resulting from deregulation will offer increased networking opportunities, especially for statistical multiplexers and higher speed modems.

There will also be a host of new market areas — centering around the office of the future, home information and desktop computer developments of recent years. The telephone common carriers in this country and overseas will have changing data communications equipment needs because of their new positions in a changed regulatory environment.

The independent data communications manufacturers are not facing an easy future, but they are certainly facing a future full of opportunity and challenge.

Charles P. Johnson is chairman of the board and president of General Datacomm Industries, Danbury, Conn.

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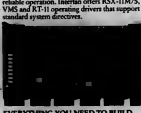

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By David L. Creighton

CHOOSING A PBX: MAKING THE RIGHT CONNECTIONS

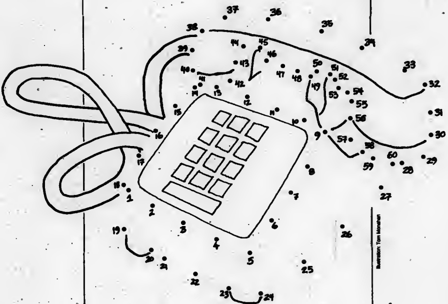


Illustration: Tom Monahan

Today's telecommunications system cannot be considered merely a necessary expense in doing business. Telecommunications is an important tool, a company's main information link both internally and externally.

How the telecommunications system accomplishes its role as the vital information link is termed the system requirement. Defining the future system's requirements is essential, not only for the selection of a PBX, but also for planning the efficient utilization of the PBX once it is installed.

Although the final system specification will be reported in the number of stations, trunks, attendant positions and other hardware and/or line service items, to get these numbers one must relate departments or job functions to present

A PBX allows managers better methods for information gathering and system control.

telecommunications system.

Talk to supervisors and other key users about their needs and show them how the new system can help them. Future growth and the addition (or reduction) of other department functions should also be taken into consideration.

Another method that may prove helpful in defining a system specification is a hardware inventory of the present system. Although the local telephone company keeps a running equipment inventory for billing purposes, these listings are often difficult to read, as well as offering rather limited information about which lines terminate in what location, where the instruments are located or other data necessary for successfully estimating system needs.

Coupling an equipment inventory with the information gathered in interviews should give one a better understanding of how the current system carries out its many functions and how to correct the system's deficiencies. An equipment inventory of the present system is a handy tool, once a new PBX has been selected, in planning the exact placement of each new instrument.

Examining Options

Since a major advantage of the PBX is the availability of advanced calling features not found in other systems, one must try to identify cost-saving applications of the three types of features when defining the system specification. One is equipment replacement features, offered by PBXs to reduce the use of expensive multibutton telephones. Two, system management features, allow the system manager to modify functions and control usage costs. The third is convenience or advanced features, for more efficient internal communications.

In selecting the right mix of features, it might be well to make two lists, one of essential features and the other of desirable but nonessential features, then do a cost-benefit analysis.

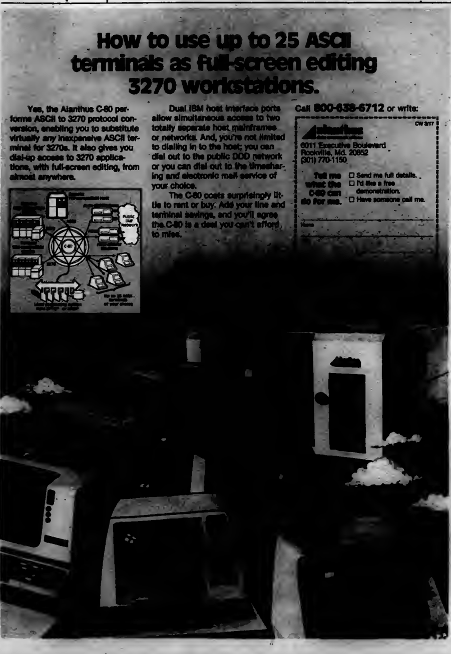
Determining Costs

The cost of a PBX includes more than the payments for the equipment itself. The purchase should also consider such factors as the rates for auxiliary systems such as multibutton units, requirements for protective coupling arrangements, insurance payments, federal excise tax on telephone company provided equipment, other tax options such as investment credits and accelerated depreciation and the value of floor space to be occupied by different PBXs. Another factor that is often overlooked in determining the costs of a PBX are the move and change charges levied by the local telephone company or interconnect supplier every time an instrument is moved or the system is slightly modified.

Most telephone equipment, provided by either interconnect supplier or telephone company, is available under several payment plans: conventional monthly rates or rental, or two-tier, lease-purchase structures. These different choices should be evaluted on the basis of their net present value (NPV) or some similar financial standard. Once the best rate plan has been found, usually the one with lowest NPV, the potential savings produced by that PBX should be included in the total NPV. This final figure will serve as a basis for the comparison of this system with other systems under consideration. In comparing all systems under consideration, the one with the lowest NPV must be the best economic choice, but the final determination will be a tradeoff between financial and optimum system characteristics.

Management Concerns

Spiraling inflation has brought in its wake ever-increasing telephone costs. The PBX affords telecommunications managers better methods for information gathering and system control than were heretofore available — services essential for the successful performance of the management function. Though some telecommunications management equipment costs extra where price,



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availability and compatibility must be measured before acquisition, most PBXs provide various feature options that are quite useful in controlling costs and assisting in system management.

Active telephone management devices control the routes by which the user accesses special service lines, including message toll, Wats and private-line networks.

Automatic route selection allows for the access of a call to the toll network through a predetermined sequence that is cost-efficient. Automatic route selection requires careful and constant monitoring to ensure that the most effective sequence is currently in use. Recently, certain PBX suppliers have introduced features that allow for the alteration of automatic route selection patterns and other station restriction classifications on a day-to-day basis providing the system manager greater flexibility in allocating limited resources.

Making the Decision

Rapid technological obsolescence is an issue telecommunications users have not previously faced, and for economic or capacity reasons it may mean disqualifying a system from consideration. The choice of a PBX can limit the range of other equipment used with the system and thus constrain future activities.

However, a PBX should not be disqualified from consideration immediately merely because it may not be compatible with future communications developments since the savings to be realized from present use may still be more than adequate to justify its acquisition.

When investigating PBX interconnect suppliers, consider what other users say about the machine under consideration. Is the supplier known for good service and rapid response? Who would assume maintenance responsibilities for the interconnecting system if the original vendor goes out of business? What degree of training for users is available and at what cost? The answers to these questions may eliminate some suppliers from consideration.

Each PBX has a unique set of features. All systems under consideration should be able to provide all the "must have" features written on the first list — the features considered essential to the system's functions. The potential savings and convenience provided by the features in the second list for each system can be weighed against the system's cost.

This procedure will winnow the field of possibilities down to a smaller group of systems with similar capabilities and prices.

Components of a PBX

Intelligent specification and use of a PBX requires an understanding of the machine's operation. Computer technology brings two new aspects to telephone switching: the control system and the switching network. These elements must be considered from the point of view of their own operation and their interaction with other elements of the PBX. While the control system is the source of many of the new capabilities, the switching network can set limits to the machine's operation.

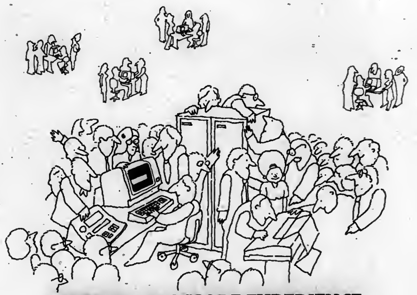
There are four different elements of a PBX: the computer, the memory, the interface equipment that connects the lines and trunks and the switching network. They influence system performance, including the level of service a PBX can provide and its compatibility with future developments.

The computer, or central processing unit (CPU), is at the heart of the PBX. Operating from instructions stored in the memory and mass storage device, the CPU controls the switching network which connects PBX stations and trunks. Controllers and adapters attached to the line terminations of the trunks and stations inform the CPU of their status and allow the CPU to initiate such actions as ringing telephones.

The minicomputer or microcomputer that provides the PBX control is similar to the larger computers which

(Continued on Page 88)

The choice of the PBX is important for both system performance and for compatibility.



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PBX Systems Observed: A Sampling

It is unlikely that IBX will remain apart from the office technologies it is intended to help integrate.

Last year, International Data Corp. (IDC) prepared a research report entitled "The PBX Market" for its Continuous Information Services clients. IDC found over 80 different manufacturers and suppliers of PBX equipment. AT&T's dominant installed base (71%) is expected to decrease dramatically as a result of increased competition in the '80s. The research report profiled a number of PBX vendors; we have chosen excerpts from five representative systems. The excerpts were chosen at random and should not be construed as endorsements by either IDC or Computerworld/Extra!.

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Exxon Enterprises, Inc./ Intecom, Inc.

Intecom is a very recent entrant to the PBX field, and its product, the Integrated Business Exchange (IBX), is usually credited with being the first of the new generation of digital voice/data switches. Intecom was founded by former Danray emplyees who left after that company was acquired by Northern Telecom, Inc. in 1978. Intecom is an affiliate of Exxon Enterprises, contained within the Exxon Communications Systems group. A fully digital switch, the IBX is able to handle synchronous and asynchronous data transmission as well as code and protocol conversions between incompatible devices. It is fully compatible with U.S. 24-channel T-Carrier standards. The IBX presently comes in only one model, the Series 40, which can handle a minimum of 600 to 700 lines and trunks in any combination up to a maximum of 4,096.

The IBX is a distributed system, in that it has a single master control unit that contains two 32-bit processors with 4M bytes of memory and up to 16 "switching partitions," which might be thought of as front-end processors. The switching partitions are built around Zilog, Inc. Z80 processors with 64K bytes of memory; they have 256 ports, each of which can connect to a terminal and/or telephone instrument. The switching partitions can be physically located up to a mile from the master control unit, using laser driven optical fiber cable.

Intecom supplies special telephone instruments, although standard instruments can be used as well. InteCom's units, called Integrated Terminal Equipment (ITE), digitize voice signals through a codec at the rate of 64K bit/sec. The ITEs, which have RS-232 or RS-422 connectors, can transmit data simultaneously with voice: the total bandwidth from ITE to switching partition is 128K bit/sec. They come in several models, with up to 30 programmable buttons to activate functions or to act as line keys. Another line of instruments, the Exec series, offers a 24-char. display.

Considered purely as a PBX, the IBX has all the standard features like call data recording, queuing and speed dialing, and offers least-cost routing and other features that are optional on some systems. It also offers some unique features, like a directory lookup system (DLS) containing up to 15,000 entries. This is in effect an on-line, updatable telephone directory that can be searched by name, directory number, department or location. It is easy to output a hard copy to use as an up-to-date office telephone directory. The directory lookup system also has a support program, "Wiring," which inventories the IBX wiring plan, listing all station devices and their connections to the system, which can be very helpful in planning reconfigurations.

However, as with Datapoint Corp.'s ISX, it is difficult to imagine anyone buying this system just to have a PBX, however sophisticated it is. The data handling capabilities of any integrated voice/data switching system will have to sell it; IBX's appear quite attractive.

In the first place, its ITEs can handle simultaneous voice and data at respectable rates of speed. Perhaps equally important is the fact that the IBX performs code and protocol conversion that makes possible a multivendor network — which is probably the most realistic assessment of the kind of environment into which this device is likely to be sold. The 3270 Intenet Packet Controller provides 3270 emulation for any standard Ascii terminal on the IBX system. This means, for example, that any word processor with an RS-232 connector can access mainframe storage and processing on an IBM or equivalent host. Other data communications capabilities include a modem pooling function. In the event that applications require accessing outside data devices over analog lines, the IBX has a resident modem pool it allocates as needed. If all modems are in use, it queues outbound calls.

Exxon's decision to place Intecom in the Communications Systems division, not in Exxon Office Systems, seems to indicate that, whatever its potential for use as an office integrator, the IBX at present is best handled in a communications context, not in the more traditional text-based office automation. However, it is unlikely that a product like IBX will remain apart from the rest of the office technologies it is intended to help integrate. Exxon Office Systems still has a good deal of work to do getting its own house in order, so it may be the wisest course not to take on a networking product at the present.

International Telephone & Telegraph Co.

International Telephone and Telegraph Co. (ITT) is truly a multinational corporation. In 1980, slightly less than half the total revenues came from operations in the U.S. Outside of the U.S., ITT is the largest supplier of advanced telephone switching equipment. Most of ITT's telecommunications equipment, in fact, is manufactured by foreign subsidiaries, including telephone apparatus, switching systems, transmission equipment and systems (ITT has fiber-optic systems in West Germany, Scotland and Spain), cable and teleprinters.

Within the U.S., ITT is active in developing alternative transmission systems, as well as manufacturing telecommunications equipment. Through its U.S. Transmission Systems subsidiary, ITT offers long-distance service similar to MCI Communications Corp. and Sprint to subscribers in over 100 metropolitan areas.

ITT has marketed several different PBXs for a number of years, some of its own manufacture, some purchased from other suppliers. One of its most popular models has been the Discovery III, manufactured by OKI Electronics of America. The Discovery III is an analog switch serving up to 512 lines. Its program control is in programmable read-only memory (Prom), and information about extension assignments, class of service and so on is stored in electronically alterable read-only memory (Earom); since both Prom and Earom are nonvolatile — they are not erased when current is shut off — this basic system information does not need to be reloaded from a tape or other storage medium in the event of power failure.

The CS-1024 is made for ITT by Womack, which markets it as the WTS-16. Intended for larger applications, it has a maximum size of 1,024 lines. The CS-1024 actually has an electromechanical switching matrix — increasingly rare among PBXs, particularly in the interconnect market. ITT Telecommunications, a manufacturing subsidiary, makes the TD series of analog PBXs: the TD 100 (100-line maximum), the TD 200 (230 lines) and the TD 500 (512 lines). The TD series was introduced in 1974, which makes it one of the older PBXs and apparently one from which most of the bugs have been removed. Like the Discovery III, the TD series has nonvolatile memory, which enhances its reliability, though at the cost of some flexibility.

Although its workhorse PBX line is analog, ITT has been rapidly developing digital capability. It is prompting a concept of an "information delivery network of the future" called Network 2000, intended to be a compatible system of digital products capable of switching voice, data and graphic images. It is apparently somewhat analogous to Northern Telecom Systems Corp.'s Digital World. ITT has begun marketing a digital telephone switching product, System 12, that is part of Network 2000. At the end of 1980, ITT claimed to have orders or letters of intent for the equivalent of more than a million lines worldwide.

At the office switching end of the spectrum, ITT has introduced the System 3100, a hybrid key/PBX system that can grow incrementally from a minimum of four to a maxi-

mum of 144 lines. The 3100 can be configured as a classical key system, with no attendant console and multiline instruments, or a PBX system or a combination of the two, using the PBX features. The 3100 system grows by increments of 24 station or trunk lines, each 24-port module being essentially independent. The effect of this is to make the cost per line of a small configuration more nearly equal to the cost per line of a larger one. Typically, in PBXs, per-line costs decrease with system size because so much of the cost is tied up in a large central processor. One way in which the 3100 offloads processing from a central unit is to use code-decode devices to convert analog to digital at the I/O interfaces, thus relieving the CPU of that task.

The 3100 processor has 64K bytes of volatile random-access memory and nonvolatile memory holding the software for operations, features, diagnostics and site-oriented information like extension assignments and the functions of programmed buttons on multifunction instruments.

ITT expects to expand the 3100's capacity to over 400 lines, which presumably would bring it into competition with the (by then) somewhat elderly TD series. This product, together with the implications of a large-scale voice and data switching network like the System 2000, suggests that ITT is going to be moving aggressively into the digital office.

Rolm Corp.

Rolm was founded in 1969 in an abandoned prune-drying shed in the Santa Clara Valley, Calif., by four electrical engineers who saw the need for an off-the-shelf computer capable of meeting the rigid demands of military applications. The products by which Rolm is chiefly known, however, are its PBXs, referred to by the company as CBXs (for "computer-controlled private branch exchange" systems). Rolm began development of its CBX line in 1973; the first model shipped in April 1975. Rolm claims a worldwide base (shipped or installed) of over 6,200 systems as of the end of June 1981. Rolm offers CBXs that cover a size range from 24 to 4,000 lines.

Rolm's strength is generally thought to be in the small to medium-size range, with estimates for an average system size running between 100 and 200 lines. Nevertheless, Rolm is actively pursuing the large systems market.

Rolm was one of the first to make a digital PBX. Rolm uses a pulse code modulation technique for digitizing sound, but the type used is not the same as the T-Carrier voice channels used in North America or Europe. Although extant standards can be approximated, Rolm CBXs are not directly compatible with future digital telephone networks predicated on T-Carrier standards.

Like state-of-the-art PBXs, Rolm's are software controlled. A series of software releases has steadily upgraded the capabilities of the CBX line by adding new features. Release 7, introduced in February 1981, supports a maximum of over 200 features. (Of course, many of these features are optional and very few users would need all of them.) The basic features include such PBX standards as least-cost routing, toll restriction and queuing outbound calls for access to the least expensive transmission facilities. There are also such management-oriented features as call detail recording and automatic call distribution. All new software releases have been made compatible with old CBX hardware and prior software, so that upgrading is relatively painless.

The most significant new feature in Release 7 is the Data Communications feature, which enables the CBX to switch data as well as voice and makes it the keystone of Rolm's plan to enter the integrated office market. The feature supports the asynchronous transmission of data at rates of up to 19.2K bit/sec over ordinary two-pair twisted telephone cable. Some additional hardware is required to utilize the feature: a data terminal interface, which physically connects any standard RS-232 data device and a telephone (if any) to the line; an interface card that goes in the CBX box; and a time-division multiplexer card that also goes in the main box. The data terminal can be up to 5,000 feet from the CBX, so that the maximum distance between two points in the network is 10,000 feet. The Data Communications feature can be added to an existing CBX system for a cost of between $600 and $900 per data line termination, which makes it more than competitive with modems currently on the market.

Rolm argues that the feature permits installation of a low-cost data communications network without rewiring, which can be a significant expense in existing buildings. The network is also flexible: data terminals can be installed anywhere there is a telephone outlet. Rolm claims its "submultiplexing" technique permits up to 40 data connections on a single voice channel without significant degradation of the CBX's performance in handling voice traffic. Standard CBX features like queuing and hunting can be adapted to data transmission uses: for example, the CBX will hunt for an available communications port on a processor.

More than any other communications-oriented entrant into the office market, Rolm is betting that networking through digital transmission over installed telephone lines will be a successful office integration strategy. For some applications, the addition of a relatively inexpensive data switching capability to an existing telephone system may be a cost-effective alternative to the Ethernet type of networking. Organizations that opt for the telephone-based network are likely to be looking for the simplicity and reliability people have come to associate with business telephony. Rolm has worked at developing a reputation for reliability and its CBXs are not more complex to operate than anybody else's.

The difficulty with being a network supplier in the office systems market is that the real rewards are not in selling the network, but in selling the equipment that connects to it. This is a problem that Xerox Corp. has recognized in regard to Ethernet, which it likens to building a highway in order to sell more cars. The long-term question for Rolm is whether it can become a successful equipment manufacturer in a field that is at least as competitive as the PBX market. Rolm's intended management workstation is a step in this direction and the minicomputer experience it has built up in the Mil-Spec division is another potential asset. It remains to be seen whether Rolm can continue to put the pieces together while maintaining its position in the increasingly competitive PBX market.

NEC Telephones, Inc.

On July 17, 1899, Nippon Electric Company, Ltd. (NEC) was incorporated as a joint venture with Western Electric Co. for the manufacture of telephone apparatus. NEC began in a single plant and has grown to become a $4 billion international industrial company. It has over 60,000 employees in 30 subsidiaries, markets in over 120 countries and has 14 manufacturing facilities in 10 countries. Telecommunications is still NEC's single largest business sector, accounting for about one-third of corporate revenues in 1980, but it is also active in data processing, electronic components and consumer electronics.

NEC has been very active in some sectors of the U.S. office automation market through its NEC Systems division. It makes a high-speed letter-quality impact printer, the Spinwriter, that is used on a number of word processing systems. It uses a variant of daisy wheel technology in which the print elements rotate around a vertical axis in a cluster referred to as a thimble. NEC also makes other peripherals, including disk and tape drives.

In addition to a line of key instruments and systems, NEC Telephones markets two PBXs: the Neax-12 and Neax-22. The Neax-12, in its extended version, has a maximum of 360 lines. The Neax-22 goes up to 12,000. The Neax-12 is analog, the Neax-22, digital. Both are stored program control and offer a standard range of PBX features. Given the extremely wide size range, NEC is truly addressing all segments of the PBX market.

NEC's involvement in advanced telecommunications and office products suggests that the Neax-22 will be marketed as a potential digital office switch. NEC Systems' growing visibility in office automation, thanks to its innovative and relatively low priced printers, will help NEC Telephone gain some visibility in the office integration marketplace as it develops in the next few years. However, it will probably also need a direct sales effort to complement its current distribution channel, which is a network of somewhat more than 100 authorized dealers.

Rolm's data communications feature enables the CBX to switch data as well as voice.

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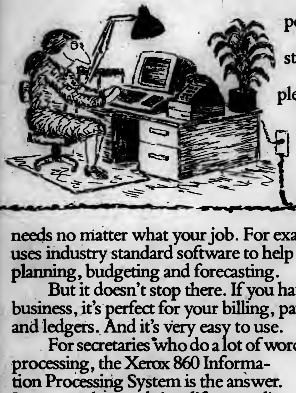

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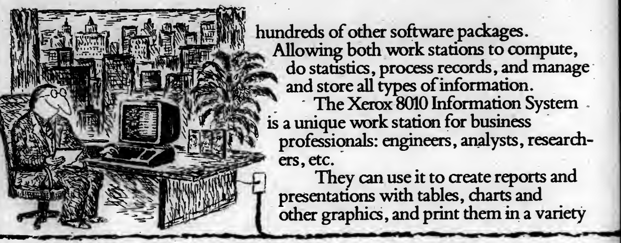

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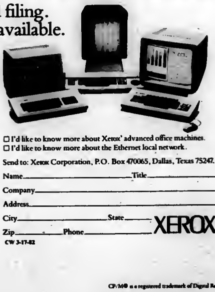

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Most PBXs provide services through software modifications, which are easy to add and low in cost.

(Continued from Page 83)

have many applications. Some manufacturers have simply designed their systems to use generally available computers equipped with special interfaces to the switching network and stations. The actual computer design and operation primarily affect the system's call handling capacity.

In order to complete a call, the CPU must follow a set of program instructions. Since the CPU needs a fixed amount of time (which is influenced by the system's design) to read and execute each of its instructions, there will be a limit to the number of instructions the CPU can execute each second. That limit will determine the maximum number of calls and service requests the CPU can deal with in a fixed period of time.

Memory Options

The fastest access memory, core memory, holds frequently used instructions. One such instruction is the basic program which allows the machine to recognize an off-hook station and send a dial tone. Designers have several options in programming features in the core memory, including volatility.

The term volatility refers to the reaction of a memory to a power loss. A nonvolatile memory is unaffected by a power failure. If a computer is turned off, intentionally or by accident, then turned back on, it can begin operation immediately without losing any information it was working on at the time of the power failure.

The trend today is to place an increased number of the basic routines in the volatile memory core with all basic information stored in a monitoring nonvolatile memory to be used as a backup.

The interface and auxiliary equipment provides several functions. These include the translation of the CPU's instructions to the switching equipment, provision of system tones (dial tone, ringing and other signaling tones), relaying line and trunk status to the CPU, storing dialed numbers to be read by the CPU and controlling the attendant's console. There is a great deal of latitude in the way these functions are handled.

Switching Network

As future applications develop, the most important element of a PBX will be the switching network. They employ diverse switching circuits offering new interconnects which range from familiar discrete path techniques (space division switching) to novel binary encoding and data switching methods (time division switching).

The apparent grade of service of a system is a function of the traffic demands placed on the system, the switching capacity and the number of trunks. Any PBX selected to be part of the system should have enough processor capacity, switching links and available trunk connections to serve the demand expected not only at installation, but also during the expected facility lifetime. In this way, the switching machine will not limit system performance.

Some machines using physical matrices may be expanded after installation by the addition of switching elements until the design capacity is reached. PBXs using modulation techniques generally have a fixed link capacity, determined by the number of slots on the main highway.

System Features

From the user's point of view, the newer computer-controlled PBX systems provide almost all features through modifications to the software of the computer that is part of the PBX. Once a manufacturer has developed the proper set of instructions for a particular feature, the cost of including these instructions in any user's system is very low, since it is easy to write and modify the instructions in the system memory.

This also means that almost all systems are protected from obsolescence. Since most functions require only a small amount of additional memory to store the instructions, systems are available with a wide range of capabilities at little or no additional cost.

For most users, major telephone system costs include operator salaries, local usage and long-distance calling charges and payments for ancillary equipment such as key systems in addition to the PBX equipment costs. Call usage charges can be controlled by the PBX by using optimum route selection programs and classes of service restriction categories.

Other feature options such as direct department calling, direct inward dialing and station call transfer can be utilized to lessen operator load, thereby reducing the need for operators. These uses of available PBX features are straightforward in scope and easy to understand in their application.

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Protocols are procedures which telephone users follow when interacting with PBXs. Protocols are defined to allow a user to initiate some PBX features or to perform a communications task requiring several PBX features. A variety of audible and, for some PBXs, visual signals originating in the switch are delivered to the user. These signals identify which system feature or aspect of a feature is currently in process and prompt the user for a possible response.

The new, sophisticated PBX capabilities introduce new problems as well as cost-cutting possibilities. All users must become familiar with the new system features and their uses. Because some callers might not understand their operation, some PBX installations could actually provide a lower level of satisfaction and more frustration to their users than the systems that have been replaced. The inability of users to cope with the new procedures emphasizes the need for more intensive training than was previously thought necessary for a new piece of equipment.

Thus, one of the most important yet frequently overlooked parameters in selecting a PBX system is the level of educational support provided by the local telephone company and its competitors. Without this support, the entire effort of incorporating a new telecommunications system into a company's operation may meet with limited success.

There are three stages involved in educating system users to achieve efficient operation. Users must understand what a specific feature does, under what conditions its utilization would be helpful and how to access it successfully. The system supplier should be able to provide the user with suitable materials to accomplish these three requirements. However, even after a successful instruction program, it will still take a long time for these new capabilities to be included in most people's communications thinking.

Certain PBXs provide electronic key sets which differ from normal multibutton instruments in that the buttons offer access to features as well as lines. Several buttons may be line pickups while other initiate special features like camp-on and call transfer. Placed in critical office or heavy call traffic areas, these devices may actually reduce user strain and calling load. A user with such a set does not need to remember the hookswitch flashes and dial codes normally needed to gain access to most features.

Selecting Features

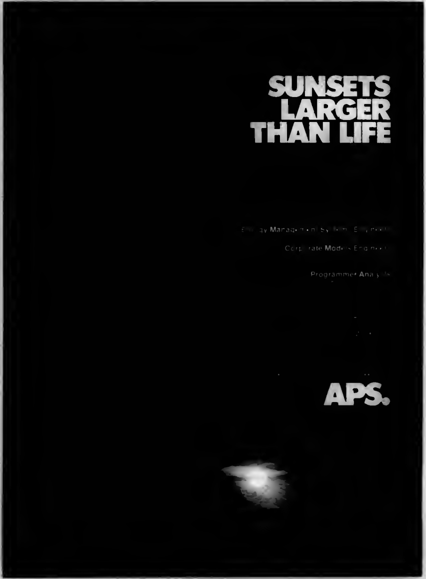
Most PBXs are supplied with full-feature capability. The manufacturer's operating program allows the system to provide all the standard features to all stations at no additional cost. The only case where an extra charge is incurred is when a feature requires additional equipment for its operation. For example, the station message detail recording and identified outward dialing features require data recording equipment to hold the collected information on station calling. This machinery is provided at an extra charge. Similarly, attendant conference features, allowing up to 13 different lines to participate in a single conference, are frequently implemented through additional circuitry provided at extra charge.

The best approach to assigning features to the different stations in a system is to define several groups of features or classes of service. Most PBXs will support a large number of different service classes. The lowest groups, for low-traffic stations used primarily for internal calling, could include such features as toll restriction and call waiting. Another service class, for executive telephones, could include a wider range of capabilities, perhaps speed calling and executive override. Once the service classes are established, the stations should be reviewed on an individual basis and assigned to one of the service classes. Of course, it may be necessary to modify the classes or to create new ones as the system needs become clearer.

PBXs open new possibilities for financial savings, achieved largely by taking advantage of the switch's "intelligence" to replace such external equipment as key systems and other ancillary devices. This eases the operator's work load by allowing callers to provide more functions for themselves and by optimizing toll call routing and restriction. As experience with the machines grows, new capabilities will be discovered and implemented. The most revolutionary aspect of the new machines, their ability to be programmed easily, is the one which will allow these new features to be implemented easily and will help protect users from equipment obsolescence.

David L. Creighton is editor at Economics and Technology, Inc. in Boston. The "Dimension PBX and Alternatives" report is available from QED Information Sciences, Wellesley, Mass.‡ ◆

Proper user education is one of the most important yet frequently overlooked parameters in choosing a PBX.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Viewpoint

(Continued from Page 14)

Could you give an example?

Well, take distributed data processing [DDP]. In its true form — that is, where multiple systems interact with one another at relatively fast rates, sharing data bases and sending information back and forth at speeds of the computer — DDP systems do not currently exist. The communications mechanisms and techniques that tie all these elements together are not suitable for true computer-speed communications and won't be for quite a while.

The local-area network is the only communications tool that will make DDP a reality. The first real application of DDP will be within buildings, not in nationwide distributions.

In 1982 you can't buy anything more than a first-generation off-the-shelf local-area network and, quite frankly, they're already obsolete. We'll need to see another generation before true local-area networking can exist to support distributed data processing.

By 1985 you will begin to see local-area nets that tie together personal computers, office computers, data processing operations, financial information, data bases and the like.

Then people shouldn't be thinking about local-area nets right now?

Of course they should. I think the local-area network is the single most important development in communications, data processing and information management of the '80s. When people don't have to get up and transport papers down the hall 10 times a day, that will really change how internal operations are conducted. This is one of the first times users have been given enough lead time to think about the problems, learn about the technology and figure out how to apply it.

If you study the problem and put a strategy together which you can start implementing in 1982, '83 or '84, you're in good shape. You can have a network plan you can use to gain top management support. Many vendors that are held in great esteem have announced products that, so far, exist only on paper. That's OK, because most users aren't ready for them yet anyway.

Where is the best place to implement a local-area net?

Data processing, because there's more to work with. There are multiple terminals wired into many machines on multiple lines and spaghetti all over the place. One executive told me the greatest DP expense his firm had was in moving a terminal.

What's more, the cost of a local-area net is lower than the cost of conventional technology. You get increased productivity and you save money at the same time. That's the best of all possible worlds!

I think this office automation thing is a big, big hype with very little substance behind it. We haven't developed the procedures, the techniques, the data bases. Executives wouldn't know what to do with the fancy terminals supposedly designed for them. Communicating word processors don't communicate yet.

However, a voice message system would have great impact on the office.

What do you mean by a voice message system?

Getting a message from point A to point B without there having to be someone at the other end. All too often, the person you call is in a meeting or away from their desk, so you leave your number. They return your call and now you're away from your desk, so they leave a message and so on and so on.

How much more efficient we could all be if you could simply leave your message in electronic storage for them — and do that using a terminal that I can operate without having to study a 50-page manual.

These fancy new PBXs are too complicated, with all the codes and button-punching, for most people. The average user learns how to perform two or three functions at the most. And the same is true for every service.

The DP manager must plan carefully so that user needs are satisfied, mustn't he?

Absolutely. First, though, he must have a top-level mandate for what the DP department should be doing. Then he needs a good strategic plan; you have to devote a portion of your time to planning, even if you're not a planner yourself.

Talk to the corporate development people. They have very good ideas, they have a methodology and they have a hunger to do something real for the corporation.

And understanding user requirements is very important. I heard a story about a high-level general who was asked what he needed to make his life easier. Do you know what he said? "If only someone could automate my calendar, I'd be happy with data processing for the next five years."

Simple systems to solve genuine, everyday problems — that's what we all need.

Contel Information Systems, Inc. is a new subsidiary of Continental Telephone Corp., formed by the merger of Network Analysis Corp. and the International Computing Co.

Network Analysis was formed by Frank and others in 1969 and counts many Fortune 1000 firms among its clients.

Network Analysis has just published a 60-page report entitled "Planning and Developing Integrated Telecommunications Systems in the 80s," which is available free by writing Network Analysis Corp., 130 Steamboat Road, Great Neck, N.Y. 11024.

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(Continued from Page 17)

Data and text. People are actively combining word processing and data entry for inquiry networks today, simply because it makes sense to use the existing DP networks for inter-office mail and for text messages. Although there is a great deal of text and data integration, very little exists yet in terms of graphics, voice, fax or image material.

How are most businesses communicating today?

The overwhelming majority are communicating for limited functions, but over a wide geographic area.

Probably the most widely used on-line application is order entry. By definition, that means all order entry points are connected to a common file, be it distributed or centralized — usually the latter.

What kinds of networks are these businesses utilizing?

Most are very conventional in nature. They employ leased lines and star configurations where there is usually a single host to which each terminal is connected.

There are local controllers and concentrators, mainly to reduce the number of lines involved. And that's about it.

What's the state-of-the-art system in integrated voice and text networks?

Well, there are several manufacturers, such as IBM and Wang, that offer a digitized voice mail system, where voice information is converted into a digital bit stream, then stored on a magnetic disk. This provides features such as eliminating pauses, editing or even interspersing text, data or coded material. This is done with standard phone lines from the PABX to the minicomputer and digital disk file.

There is a problem with integrating them, however. You can't packet-switch voice, because it has to be reconstituted into an analog signal at a very rapid repetition rate. If a packet drifts around through a switched network for a significant fraction of a second, the voice message is interrupted.

Packet technology today is simply unsuitable for voice. For that matter, it isn't suitable for facsimile, videoconferencing and the like, either.

Many companies want to send video or images, though. What should they do?

Twisted pairs can be pushed up to about 56K bit/sec, which might seem satisfactory, but if you need to send high-speed fax or full-motion videoconferencing, it's not nearly enough. You may need to put in wideband digital or analog facilities, but these don't need to be integrated either.

The fax machine or the videoconferencing room are in fixed locations — no one wants to move them around — so all you have to do is run one heavy trunk cable to that point, then out to the microwave antenna on the roof.

What would a microwave antenna or earth station cost?

A fully-equipped, two-way satellite earth station costs not less than $250,000, possibly more. But a receive-only station would cost less than $10,000.

That brings up an interesting point. A lot of teleconferences involve a presentation outward, such as a new sales plan, with a question and answer session afterward. Some businesses already utilize one-way video broadcasting outward and two-way switched voice return.

Would this trunk cable you mentioned be part of a local-area network?

No. It would be a separate, dedicated line.

There seems to be a problem, then, in installing a local-area network if you don't know what services you expect from it.

Well, some of the first users may be experimenters who want to find out what the system will do. Others will simply want to reduce the cabling, where many conventional data and text terminals are installed. The momentum will grow slowly, and I expect that by the late '80s we will see more open-ended and managerial support systems installed. It's a real problem for users to project what their service needs for 1990 are going to be.

There is no way to know except by taking the evolutionary steps.

Isn't that rather risky, considering all the products on the market and the fact that, once a particular technology is installed, the firm is pretty much committed to it?

Indeed it is, and this is why users would like to adopt standards for protocols and make software and hardware commitments allowing open, integrated networks for at least a decade. The idea is to be able to plug any gadget from any vendor into the wall and have it talk, as necessary, to gadgets from any other vendor.

Now everyone knows that isn't possible. That's not the vendor's fault; it's an embryonic user market in terms of specific requirements. Vendors can't develop universal, finished protocols for all purposes and, of course, they don't choose to standardize, except slowly and as serves their own business objectives.

How does the user minimize the risks?

Our view is that there is an optimum course of action for network planning for the next five years or so, which hopefully maximizes cost-effectiveness and minimizes the risk of choosing the wrong standard or network architecture.

Briefly, it consists of the following points.

First, limit your objective. Presume that in 1985 or 1986 you can have a network that interconnects computers from two or three vendors — you must limit the number early on — that will interconnect word processors from two or three vendors, but no more — and, similarly, equipment from terminal vendors.

Second, do not anticipate incorporating voice or wideband image bit-stream material in the same network. We don't believe the technology will be mature and the need probably won't be that great, since you can always wire from point to point.

Third, proceed to evolve toward your limited objectives for 1985 or 1986.

That involves analyzing the existing installed networks. Many large user organizations now have multiple data networks that were installed for single applications, such as order entry or customer service. Some employ old protocols, such as async, bisync or whatever.

In addition, some of the software to control these old networks may be bundled at the host level. These networks must first be identified, then analyzed according to a common reference. The most convenient common reference today is the International Standards Organization [ISO] seven-level conceptual open-systems model.

It may be that no vendor ever implements that model exactly as de-

There are several voice mail systems that convert information into a digital bit stream and store it on disk.

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An AT&T television set is a great deal more likely than an AT&T 3081.

fined, or that no user will want it exactly that way. However, it is very useful in determining where the functions are performed and by what.

With this information in hand, the user can then define a migration strategy by which he can move from his present networks and control software toward his version of a limited, integrated and open network for the next five years. This migration can be done simply by modifying existing systems programs and applications one by one as they come up for routine maintenance.

The idea is to separate the network control functions, moving from control at the mainframe toward controllers located in the network, then replace homegrown software and protocols with those with standards which are likely to be maintained by the major manufacturers.

And what standards would you recommend?

It's hard to know what the most robust standards will be in the long term, but you can be pretty sure that X.25 — which I think is now supported by every major vendor — will live and grow if anything will. The subsequent levels 4 and 5 of the ISO model have been distributed for comment; we can hope they will be usable. Obviously, IBM's SNA standards will also be supported. IBM has changed SNA a great deal over the years, but they have done so in an evolutionary way without discarding the early standards. Maybe that will be necessary some day, but IBM will try to avoid it and we can hope any user adopting it will be able to survive with it.

Do you see a bright future for computers and telecommunications?

Indeed. The computer has been wed to communications for some 10 years now, for example, through airline reservations systems and on-line order entry. This is only the tip of the iceberg.

Will IBM and AT&T eventually compete?

Well, AT&T has been in head-on competition with IBM for some time now, selling Teletype Corp. terminals. Satellite Business Systems, a common carrier in which IBM owns one-third stock, is another example. The two have been in direct competition for a long time.

Is AT&T likely to build and sell computers?

No way, as far as large mainframe-data processing systems. With the exception of Unix, Bell has not done a great deal with systems programs and they are the heart of any data processor. Most users are committed to their MVS or IMS and are unlikely to change.

However, Bell is likely to consider anything that grows out of the telephone instrument or a terminal, including executive workstations and the processors to back them up, or even intelligent television sets with two-way capability.

It may seem strange now to envision an AT&T television set, but that is a great deal more likely than an AT&T 3081.

And it's equally likely that we'll see an IBM television set in competition with the AT&T set when they both have a microprocessor, extended digital storage and the capability for two-way communication, both in software and information — all on top of the original entertainment function.

Could this be why Zenith Corp. has built telephone capability into its high-end television sets?

Most definitely. Zenith understands these advanced capabilities for mixing media and will no doubt be attempting to lead the way. And, of course, AT&T is observing this with the greatest interest.

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and at a different bandwidth. The choices are incredible; the differences are large. What's clear is the field is changing very, very quickly. The products have not stabilized. Unless the need is urgent, my advice is to wait a while.

How long?

It will be at least a year before the weak companies fail and the dust settles enough for us to see the likely successful implementation.

And what if the need is urgent?

The danger is that all these different, heterogeneous systems will be put in place in small pockets of the country or industry and then we'll face an enormous incompatibility problem.

I see no way to avoid that. As a consequence, a market will arise for gateways, such as we see now for protocol converters that will be used to provide data flow between incompatible networks.

Isn't anyone trying establish standards?

The IEEE Group 802 is, but in their infinite wisdom they have established three standards, which seems to me to be no standard at all. One they have agreed upon is a CSMA/CD [Carrier Sense Multiple Access/Collision Detect] looseband scheme similar to Ethernet.

The other two are token-passing schemes, one on a broadband CATV coaxial bus and the other on a twisted-pair ring.

It'a not clear that any of these is the right access method. Every day, in the technical and industrial literature, we see new suggestions for access schemes reported on, many of which are uniformly better those being considered.

For example?

Well, take the matter of taps again. A passive tap is better than an active one. Ethernet uses active electronics at the cable for the tap. The reason it does so is to avoid loading the cable with stray capacitance.

One can design passive taps, using inductive coupling, which can also detect the direction from which interfering signals come. This allows access methods based on knowledge of which direction competing traffic moves.

Electrical engineers know how to design this kind of technology — and computer scientists generally do not — but it has not been explored or considered by members of the standards committee. It'a a difficult dilemma. The field is too young from a technical view to establish a standard, but the demand from industry for a standard and for products is there now.

So what do you see occurring?

This mixed standard from the IEEE group will be adopted and it'a likely that in a few years a new and better standard will be accepted, which will cause some problems in upward compatibility.

Can't anyone else establish a standard?

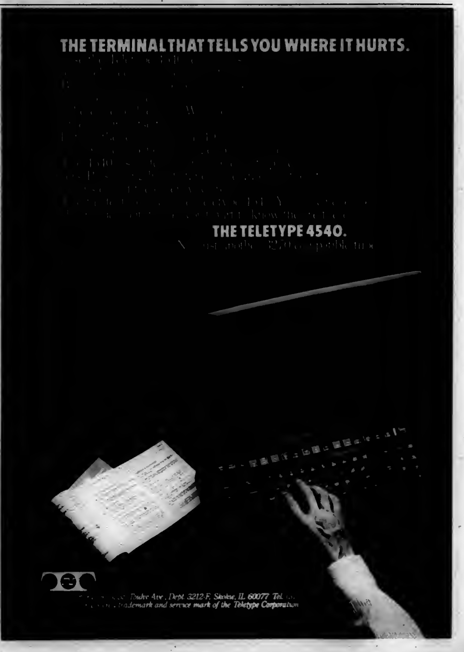
Perhaps CCITT or ISO, if things go to an international level, but I haven't seen much from them. I believe ISO is cooperating with IEEE on their standards. But I don't see how any group can do a good job on standards. It's too soon and there is not yet a sufficient basis for a standard.

Then, it seems, products will continue to proliferate?

Yes, and the problem of connecting these incompatible networks will be big business. We seldom have

(Continued on Page 96)

> ***Unless you urgently need a local-area network, my advice is to wait a while.***



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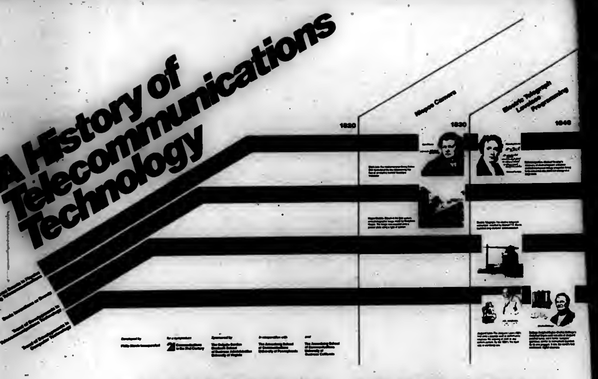


In April 1981, a two-day symposium, "Communications in the Twenty-first Century" was held in Richmond, Va. It was sponsored by The Colgate Darden Graduate School of Business Administration, University of Virginia, in cooperation with The Annenberg School of Communications, University of Pennsylvania, and The Annenberg School of Communications, University of Southern California and funded by Philip Morris, Inc. Before an audience of over 400, speakers discussed virtually every aspect of communications.

Elie Abel, professor of communication at Stanford University, explained how flows of communication in the history of mankind have accelerated:

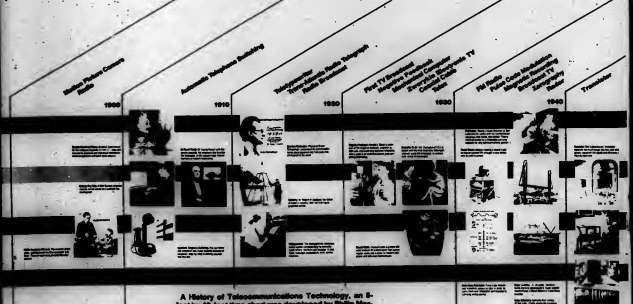
"From spoken language to writing: at least 50 million years.

"From writing to printing: about 5,000 years.

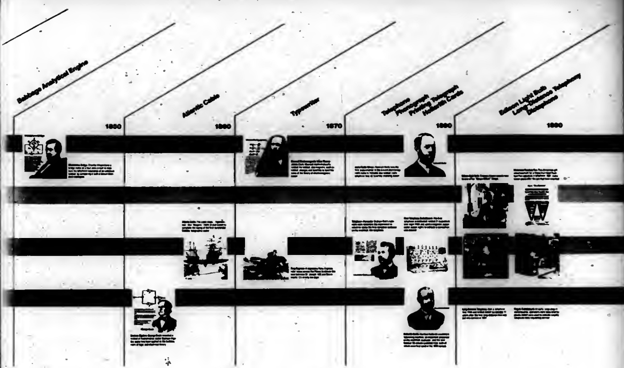
"From printing to the development of sight/sound media (photography, the telephone, sound recording, radio, television): about 500 years.

"From the first of the sight-sound media to the modern computer: fewer than 50 years.

"The year 2001 will be on us before most contempo-



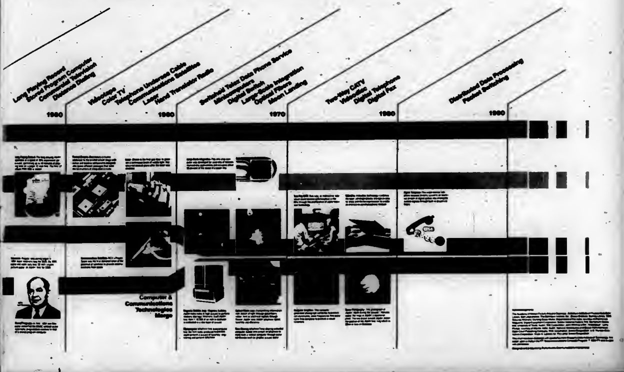
A History of Telecommunications Technology, an 8-foot by 42-foot time chart was developed by Philip Morris, Inc. for the symposium and presented to the Science Museum of Virginia. The chart is available as a poster. To order the poster or the book, write Joan Mebane, manager of communications research, Philip Morris, Inc., 100 Park Ave., New York, N.Y. 10017.



raries have digested the implications of the discoveries and inventions already accomplished."

Arno A. Penzias, Nobel laureate and executive director of research for Bell Laboratories' Communications Sciences Division, said, "Technologists dream of a human-machine interface that will offer flexibility, feedback and freedom from physical contact. Such an interface would let us talk to the machine and have it understand and respond. The burden of understanding would shift from the person to the machine. "Designing and building such an interface will not be easy, but there are grounds for optimism. Until recently, the cost of creating such specialized computers was prohibitive for all but the most important applications. By the use of advanced computer-aided design techniques, however, it should soon be possible for almost anyone with a particular need to design a specialized computer to meet that need. Computer users will act as computer designers, using one kind of friendly interface to help create others."

John Wiley & Sons published the proceedings in the book, "Communications in the Twenty-First Century."



Viewpoint

(Continued from Page 20)

(Rehert)

How does the firm or the DP manager plan for these emerging technologies?

They must keep options open.
What we term data today is evolving; voice store-and-forward technology, for example, is emerging as a basic messaging capability. Programming data processing systems is a technique transferable to how you will use other media, such as voice, video, image and the like.

Someone now planning for three to five years from now should anticipate that some of the relationships between data storage and processing functions, new technologies and additional media will evolve.

And only the DP manager can provide this knowledge and awareness for the firm?

DP managers who understand their company's business plan and technology have the best potential to accomplish these goals. Many people outside the technology are afraid of it, and the DP manager must build a trust and an interdependency to make the business strategy work. As companies develop information business opportunities based on their original business, this partnership is critical. DP managers who can develop this kind of trust and relationship will, in my opinion, find themselves more respected, more rewarded and more fulfilled in their work.

Bell Laboraties was established in 1925 as the research arm of the Bell System. Its first scientists came from Western Electric Co., but were joined by AT&T colleagues in 1934. Bell Labs now employs over 23,000 people at 18 locations.

Bell Labs is probably the most significant research group in the world. It holds patents on over 18,000 products, including the original transistor and the first cathode ray tube. Four Bell Labs scientists have received the Nobel Prize for their work. Along with encouraging innovation, a liberal attitude toward patent licensing and publications exists to foster sharing knowledge and information. ◆

(Continued from Page 93)

(Kleinrock)

seen such a situation, although another example is the demand for small business computers in the last two or three years. The market is proliferating and many products perform at a lower level than business requires, yet the businesspeople don't understand why.

Businesspeople basically don't give a damn about the details of computing; they just want the system to work. Many vendors pretend to provide service and never explain the complexity, the difficulty of making the system perform as it should, and the cost of software development — and the agony that accompanies it.

Didn't Xten offer a solution to the problem?

Yes, but unfortunately it was withdrawn from the market last year. The idea was that it would take some in-building communications systems, such as Ethernet, and provide building-to-building communication, say within a city, via microwave radio, (a multiaccess distributed channel), pipe that to an earth station and then use satellite communication between cities.

Isacomm and possibly Macomnet might be offering products very similar to Xten, so all is not yet lost.

So there may, in fact, be some light at the end of the tunnel.

Of course — after all, we are a nation of optimists. The ability to interconnect your local-area network with a city or a national or even a global network is extremely attractive and likely to come about. You would want access to value-added networks as well, and these new systems should provide that.

You can't afford to be isolated. You need to be connected with the rest of the world, and the many new capabilities from modern computer/communications technology provide the means to accomplish exactly that.

The trick is to identify when the various components of technology have matured enough to make your investment worthwhile. ◆

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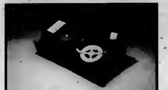

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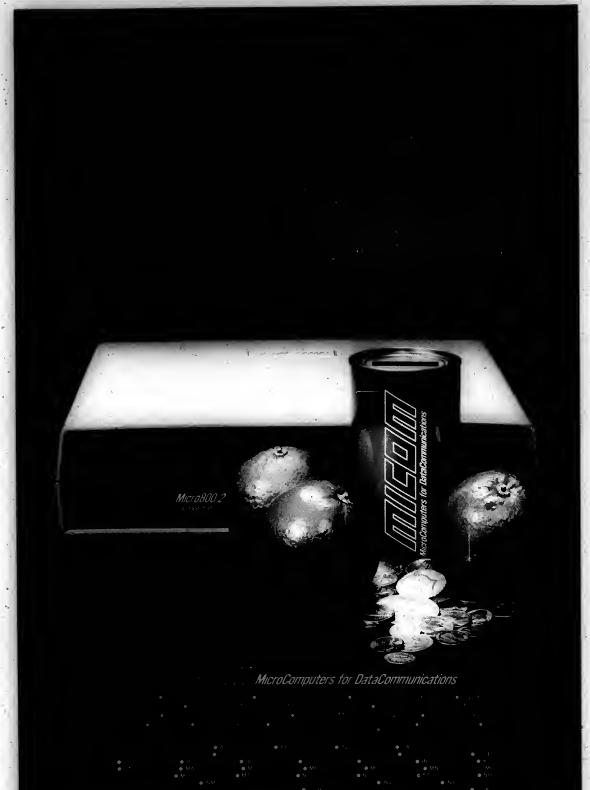
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